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REVIEW OF WORLD AVIATION

IN THIS ISSUE:

Wings over No-man's Land

VOLUME V 3 1950

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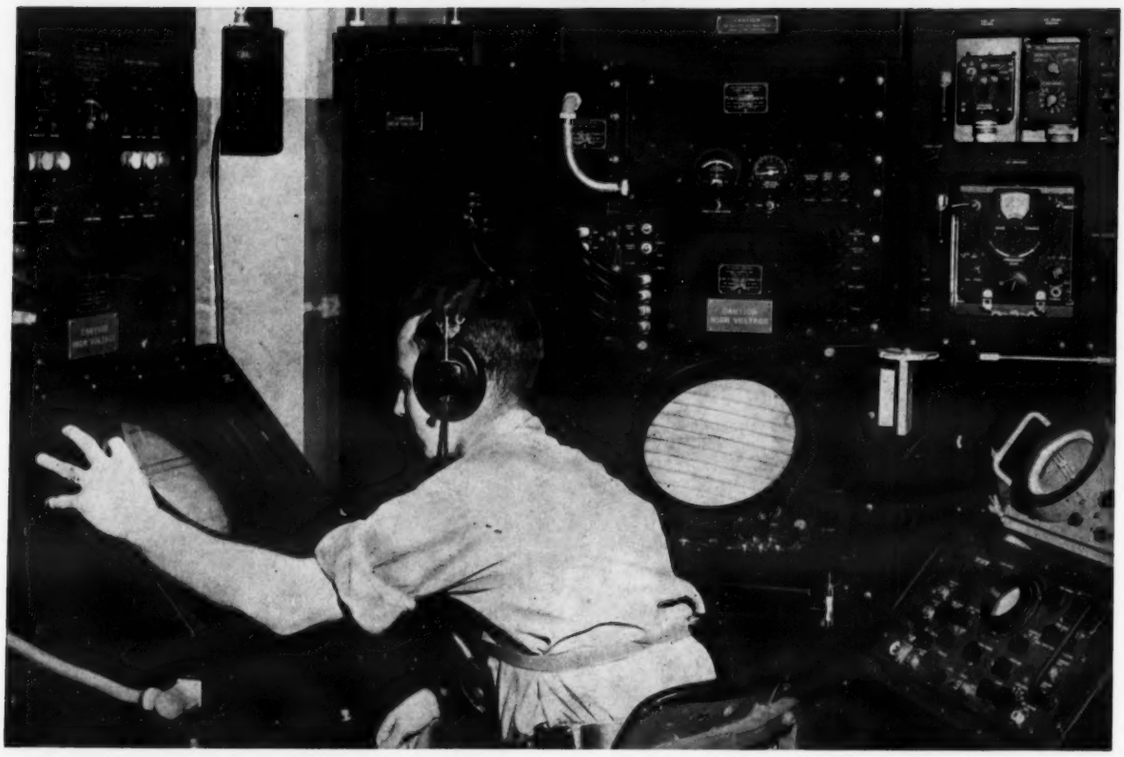

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Volume V 1950 No 3

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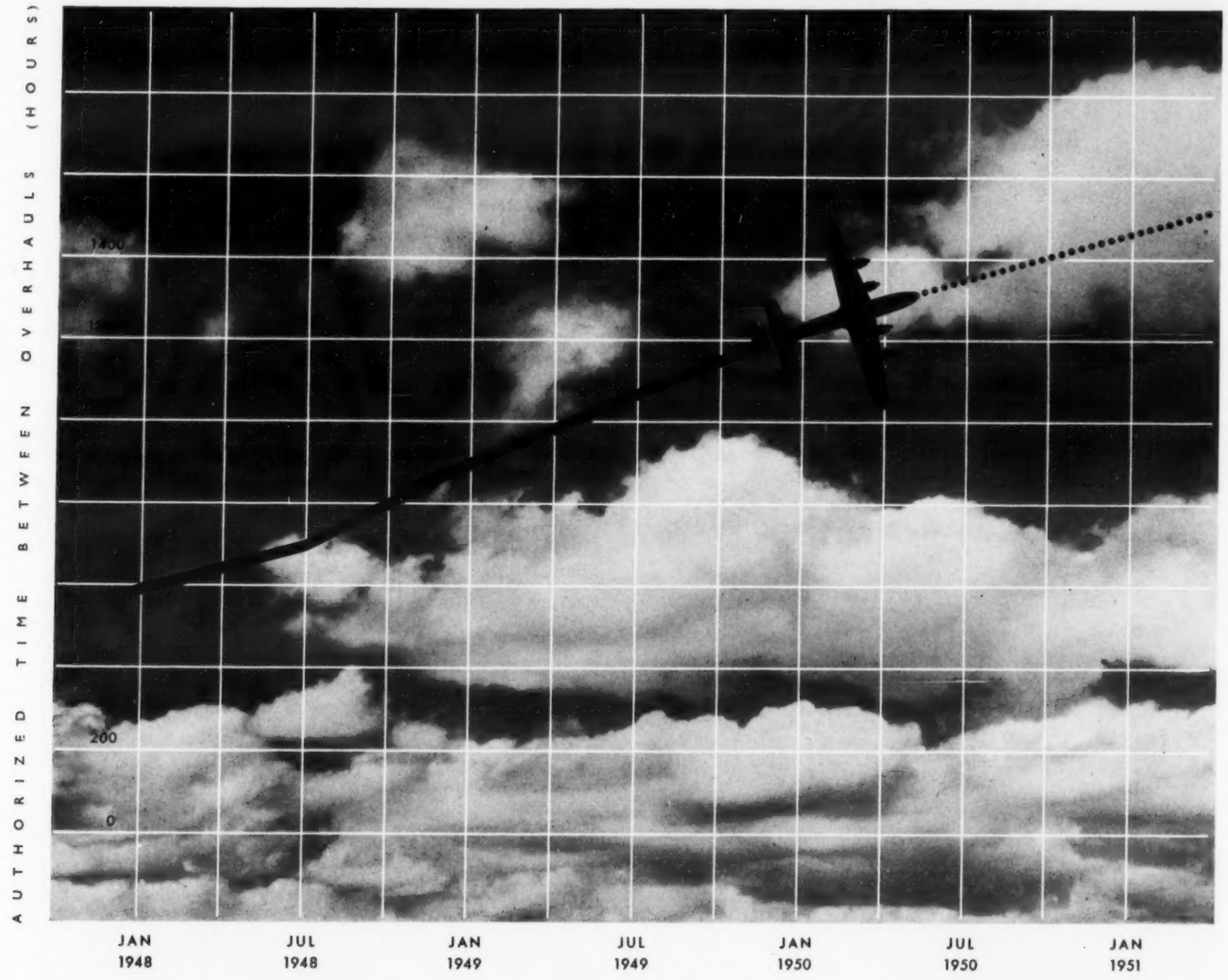

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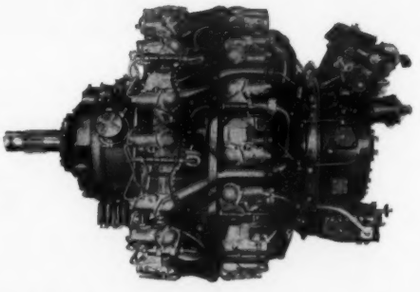

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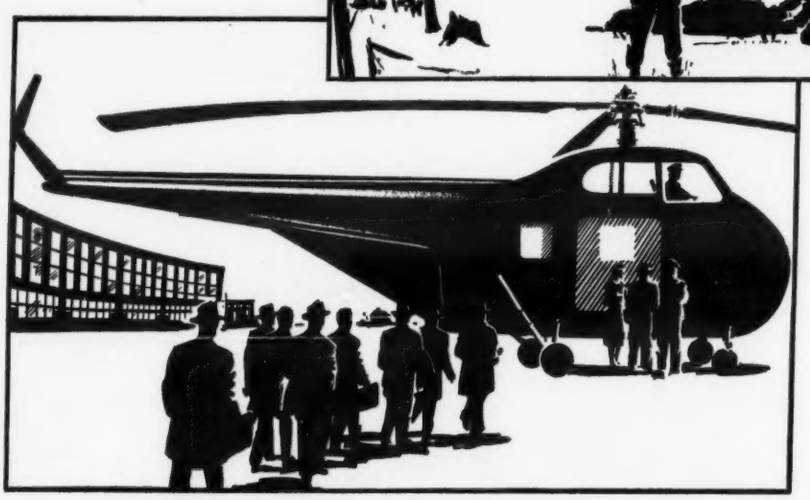

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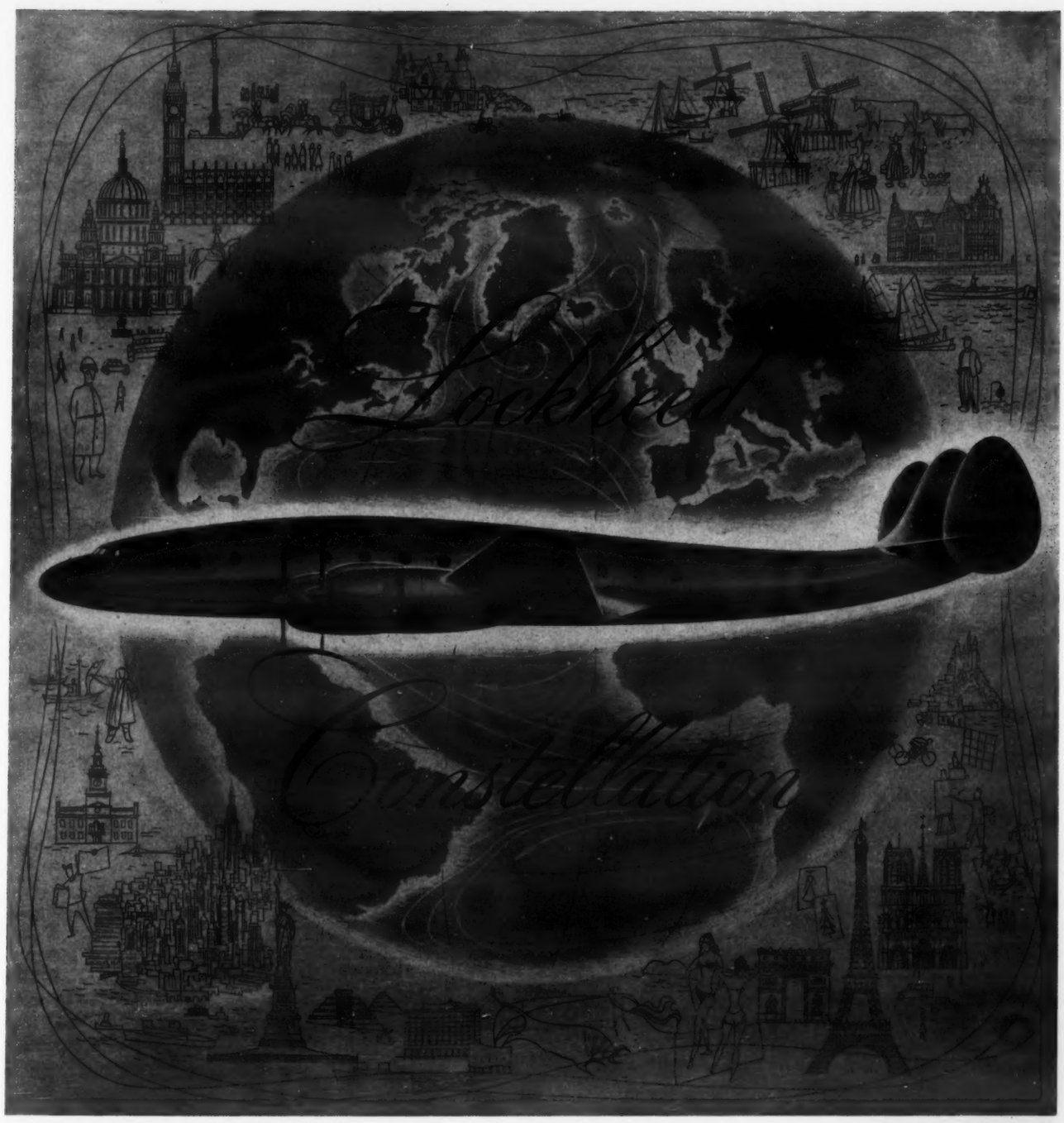

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Between the Potomac and the Moskva

"Decision in Germany"—An interim decision

"On May 12, 1949, at 12 : 01 A.M., our trains and trucks, carrying food and coal, crossed the boundaries between the Anglo-American Zones and the Soviet Zone en route to Berlin. The steady drone of the air lift planes was still heard overhead. They had broken the Soviet attempt to drive the Western Powers from Berlin by denying them access by land and water.

"That same morning I flew to Frankfurt to join my British and French colleagues in approving the Basic Laws which would bring into being the Federal State of West Germany.

"For four years we had struggled for understanding among the four occupying powers and found that it would result only from acceptance of the Soviet will to dominate Germany. We were forced to combine the American and British zones to achieve economic progress and subsequently to include the French Zone to form a West Germany in which 45,000,000 German people are separated from 20,000,000 German people by the Soviet-constructed 'Iron Curtain.'

"How had this come about? Why was it impossible for four countries who had fought for victory in a common cause to cooperate in peace? Why had the Soviet Government imposed a blockade on Berlin? Why was it necessary to create a West German Government? Neither these questions nor the decisions they made necessary occurred to me in the Spring of 1945..."

General Lucius D. Clay, first American High Commissioner for Germany, author of the book "Decision in Germany."

"Decision in Germany" General Lucius D. Clay calls the book which he begins with the above sentences*. Is he entitled to speak of a *decision* in Germany ?

On April 17th, 1945, General Clay was appointed Deputy Military Governor under General Eisenhower. On May 7th, 1945, he witnessed the German capitulation. On June 5th, 1945, he became one of the co-founders of the Allied Control Council in Berlin which was destined to elaborate the statutes of occupation of the vanquished country and shortly after to become inoperative. He took part in the Potsdam meeting and in the Conference of the Foreign Ministers of the Big Four in London. On March 15th, 1947, he was appointed American Military Governor for Germany ; on March 31st, 1948, he watched the Russians imposing their blockade of Berlin. On June 25th, 1948, he inaugurated that historic feat of air transportation which has since come to be known as the "Berlin Air Lift" and which has averted the Western Allies' retreat from the German ex-capitol and, possibly, another war.

General Clay was the driving power behind the events leading to the creation of a West

* "Decision in Germany," by Lucius D. Clay, Doubleday & Company, Inc., 1950, New York City.

American aircraft over the Rhine.

May 12th, 1949 : the last U.S.A.F. transport to fly the airlift from Frankfurt to Berlin.

German Federal Government on September 1st, 1949. Indirectly it was he who turned Germany's money into a "hard currency" by placing it on a stable foundation.

On May 12th, 1949, at 12 : 01 P.M., he considered his mission as accomplished, believing that a decision had been reached in Germany. In effect, things had progressed to a point where he was able to order the gradual closing down of the air lift. He felt justified to transfer certain powers to the West German government. And on May 15th Lucius D. Clay finally left the territory which now figures on Europe's map as the West German Federal Republic. Decision in Germany ? Hardly. General Clay had succeeded in bringing about an *interim* decision.

When he left Germany, millions of people in Berlin were grateful to him in the knowledge that it was he who had saved them from starvation. About forty-five million more in West Germany will always remember that it was he who gave them back a measure of freedom. But neither glittering welfare parades in Germany, nor a hero's welcome in Washington can obscure the fact that Lucius Clay never achieved the aims which he had originally set himself : an unequivocal clarification of the situation in Western Germany, a full cooperation with the Russians, or else...

It was this "or else" which finally proved to be his stumbling block. Washington had no intention of forcing a show-down.

Many an other decision made in Germany has a temporary character. It takes neither great statesmanlike insight to see that in the long run the forty-five million people living in the Western Zone of Germany can and will not be separated from their twenty million kinsmen in the Eastern Zone. Nor does it require great statesmanlike foresight to understand that a people of sixty-five million souls will not accept six co-existent governments. For today there is a West German Federal Republic, an East German People's Republic, an East German Military Governor of Russian nationality, and three West German High Commissioners of American, British and French nationality, respectively. Conceptions of this sort are practicable so long as the defeated people is down and out, has resigned itself to the occupation and is grateful to anybody exercising some form of government control. But if this subjected people is again allowed to have a constitution, if a vanquished nation is again given a definite form of government, and if the victors help this nation with its reconstruction or at least are interested in its recovery, such conceptions cannot indefinitely be regarded as valid.

General Clay closes his book on the following note :

"We cannot and should not forget the destruction Hitler brought to the world, nor the potential cruelty which led to concentration camps and mass exterminations. We cannot forgive the German people for permitting such things to happen.

"However, we must remember that the people in a police state have little to say and their moral and spiritual qualities deteriorate rapidly. Their faith in just government cannot be restored overnight, or by force. The people of Germany are industrious and able to contribute to the well-being of Europe. They are enjoying freedoms now which they have not possessed for many years. Their understanding of democracy will grow under democratic procedures if they are helped by those who know and love freedom.

"West German government cannot endure over the years unless it is taken back into the family of European nations who believe that the rights of the individual are too precious to be submerged in the state."

*

And now General Clay lives in the United States as a private individual. Americans continue to consider him an authority on German problems, and this is hardly surprising.

In particular, there is one important problem which has been preoccupying the minds of people all over the world. To some of them the question is of utmost urgency, to others it seems pre-mature. It is simply this : should Germany be re-armed and led back into the Western European family of nations in order to obtain her active participation in the protection of Western Europe ?

And the editors of one of the largest weekly magazines in the world, "Life," of New York, at the beginning of 1950 went so far as to put this question to General Clay, expert on Germany. Clay's answer shows that he is not only an officer and an able administrator, but also a diplomat :

"Such an event can only be examined in terms of the whole defense pattern of Western Europe. It cannot be considered in a vacuum. But two facts seem plain enough. One : the West German people are entitled to some security against agression. Two : the military occupation that now provides that security cannot be expected to endure for all time... Today no one *of the free countries of Western Europe is economically able to provide all-round defense. Yet each is trying to—wasting vast sums of money and manpower in an effort that ends in ineffective air forces or ineffective ground armies or ineffective navies. It is a case of a little of all—and a lot of nothing.*

"I believe our policy must be to continue to increase the power of the elected government in Germany as it demonstrates its capacity to govern democratically... If we create a vacuum in Central Europe, we may be sure the Germans will—as would any other people—seek to escape it, in one direction or another."

Refugees from Eastern Germany at the zonal border.

The ideas contained in the General's declaration are neither those of a Delphic oracle nor the world's unanimous opinion. "Life" knew exactly why it had addressed itself directly to Clay. The opinions of its Editor-in-Chief, Henry R. Luce, carry weight even in Washington, and Luce pursues a very well-defined line.

Some time ago already, at the beginning of last November, the same periodical published an editorial entitled "The Rise of Western Germany" which, among other things, had this to say :

"Four years and seven months after the unconditional surrender which was to bury German power for all times, the resurrection of German power is the foremost fact of Europe.

"Consider Germany today : severed, occupied, impoverished, sick of soul and torn of body, so shackled and enfeebled that even to speak of 'German power' is, on the face of things, to be absurd. Yet the U.S. and the Soviet Union are contending for the soul, the body, the power of Germany. The mere beginnings of resurrection, the first signs of sovereign vigor in the new government of West Germany are enough to alarm the whole of Western Europe. The policies of governments, the calculations of strategists and statesman turn upon these certainties :

Who Holds Germany Holds Europe ;
and
The Shape and Fate of Western Germany determine the shape and fate of Western Europe.

"... A tougher question is whether to rearm the Germans. On this subject some official reticence is justified. But evasive doubletalk is not justified, and this is precisely what the Western public, including the Republic of Germany, is being fed right now... Defense Secretary Johnson said in Frankfurt last month (October, 1949 ; — Editor —) : 'President

Truman has said that the U.S. has no intentions to rearm Germany. That is official U.S. policy with no hedging and no dodging.'

"That is official policy all right, and it is a very silly statement. Why is it silly?

Sooner or later the Western Germans are going to be rearmed, or they are going to rearm themselves."

And Henry Luce, who sells four-and-a-half million copies of "Life" every week, adds that this was not speculation or arbitrary opinion but a predictable certainty.

Now it is a fact, so far as Henry Luce in concerned, that he is used to logical thinking. Nevertheless, his assumptions are a little premature. Some Americans may agree with his views, and so may a number of Britons, judging by Churchill's recent declaration. Less enthusiastic will be the French, Dutch, Belgians and Danes. What the Russians may think in this connection had better be left without comment.

Another factor is that, although Western Germany is an autonomous federal republic in name, it possesses none of the sovereign rights a republic usually has. There are three High Commissioners or allied "shadow governments" in Germany, and these governments control the allied armed forces. The principal question arising at the moment, however, is whether the Germans *want* to be rearmed at the present time. This would be interesting to know, especially because the Germans still have a lot of other worries and are still deprived of certain civilian rights of sovereignty.

The West German Federal Republic — an Entreprise under Forced Management

In its origin and in its present state, the government of the West German Federal Republic, the so-called Bonn Government, is a very peculiar creation. To describe it as a colonial government would be a little too harsh. Judging it by the powers it wields, it somewhat resembles the governments of the British Dominions prior to World War I. The strong man in those countries was the British Governor-General, and in Western Germany it is the three High Commissioners of foreign nationality who can issue their directives to the Bonn Government.

It was the Americans, and particularly General Lucius D. Clay, who insisted upon really free elections in their zone of occupied Germany. It was on January 23rd, 1946, that such elections were held in Germany for the first time since 1933. They marked the beginning of the West German democracy. But it was only on September 1st, 1948, that the Parliament of the West German Federal Republic first convened in the provincial city of Bonn on the Rhine to adopt a constitution which had been worked out with the approval of the High Commissioners.

It may be useful to devote a few moments' attention to the group of men who today guide the destiny of this Federal Republic.

To begin with, there is a representative head of the Republic, old *Professor Dr. Heuss,* who modestly and in a dignified manner exercices the functions of Federal President from his official residence at Viktorshöhe, near Bonn.

Better known and considerably more dynamic is *Federal Chancellor Dr. Konrad Adenauer,* who assumed his high office at the age of 73. Former Lord Mayor of the prosperous city of Cologne, he had governed that town in the literal sense of the word. During the time of the Weimar Republic he once was slated to become Chancellor of Germany, but he preferred to play his role in Cologne. A devout Catholic, a man of the world, with extensive connections with the Church, industry and finance, he is characterized chiefly by his authoritarian attitude and his unbounded ambition. First and foremost he is a citizen of Cologne and a German, but he is also a European. On occasion he seems to be dreaming about Charlemagne's empire, in which Germans and Frenchmen lived united. He has always been attracted by the French neighbours, whereas his relations to the British are more formal. To him a German Reich in Europe did not mean the Third Reich of the Nazis. When Hitler came into power, Adenauer went off to prison, once in 1934 and again in 1944. In 1945 the Americans brought him back and reappointed him Lord Mayor of Cologne, but a few months later the British dismissed him on the grounds of

John Jay McCloy, High Commissioner for the American Zone.

Professor Dr. Heuss, President of the West German Federal Republic.

Dr. Konrad Adenauer, Federal Chancellor of the West German Republic.

General Sir Brian Hubert Robertson, until recently High Commissioner and Military Governor for the British Zone.

André François-Poncet, High Commissioner for the French Zone.

The four "regents" of the West German Federal Republic. Left to right : the American McCloy, the German Adenauer, the British General Robertson, the Frenchman François-Poncet.

"inefficiency." Today he is the Federal Chancellor.

In that capacity he works in close cooperation with *John Jay McCloy,* the American High Commissioner, whose administrative centers are Frankfurt and Wiesbaden. A scion of an old American family, born in Philadelphia in 1895, he served as an officer in World War I and later practiced law in New York. He joined one of the most prominent New York firms of legal consultants as a partner and managed the company's Paris office for a short time. This interlude served him to widen his understanding of the affairs of the world. In 1940 he placed himself at the service of the U.S. Government, first became the right hand of War Secretary Henry L. Stimson, subsequently Under-Secretary of the U.S. War Department. In this capacity he was charged with the elaboration of plans and guiding lines for America's policy of occupation in Germany. In 1945 he returned to his legal practice, later became Chairman of the Bank of International Payments. In May, 1949, he again held the centre of public attention when he was appointed High Commissioner for Germany in succession to the Military Governor, General Clay.

Unlike McCloy, the British High Commissioner for Germany, *General Sir Brian Hubert Robertson,* is a dyed-in-the-wool soldier. Before him his father had been Commander in Chief of the British forces of occupation in Germany in 1919. The younger Robertson therefore merely continues the family tradition, again with headquarters in Cologne. By the time these lines come off the press, General Robertson will have left his post. He will have been succeeded by civilian in the person of *Sir Ivone Kirkpatrick.* Sir Ivone is a career diplomat and before the war was on the staff of the British Embassy in Berlin.

There seems to be no doubt that the French High Commissioner, *Ambassador André François-Poncet,* has acquired a more profound understanding of the German character and the proverbial German lack of political talent than any of his colleagues. The spiritual elegance of the man is in keeping with the official residence of the High Commissioner in the idyllic resort town of Godesberg on the Rhine. A brilliant pupil of the Ecole Normale of Paris, the most famous educational institution in France, he became a professor of the German language, journalist and author. Today, at the age of 62, he is an expert on German literature. He served as an officer in World War I and in 1923 was assigned to the French occupation commission Germany. Subsequently he entered politics, was elected a Deputy to Parliament, later was appointed Under-Secretary of State for the Fine Arts, delegate to the League of Nations and, in 1939, French Ambassador in Berlin. He correctly forecast the coming disaster and in 1938 applied for transfer to the Ambassador's post in Rome. He was not spared Hitler's traditional gratitude for the many things he did in the interests of Germany. The Gestapo arrested and deported him to Germany in 1944, where he was liberated by the Americans. François-Poncet retired to private life, resumed writing his political articles for the "Figaro." In 1949 he was appointed French High Commissioner for Germany.

These are the four men who meet at regular intervals at the greatly expanded Petersberg hotel on the Rhine to discuss the fate of 45 million people in Western Germany. After five years of occupation these Western Germans today again begin to be considered as worthy of interest. In effect, some people regard them as the key to Europe, where as others would even go so far as to rearm them. If one thing can be taken for granted, it is that the rearmament problem does not preoccupy the four key figures of Western Germany.

The three High Commissioners are, chief of all, the representatives of the Allied Forces of Occupation which roughly cost Western Germany a thousand million dollars per annum. To them falls the task of seeing to it that the "severed, occupied, improverished and sick" German people is restored to health and that it grows into a useful member of the Western European family of nations. Furthermore, they must see to it that the military laws and occupational statutes are respected so long as the occupation endures.

However, the West German Federal administration cannot be regarded as a sovereign government while these rules and regulations remain in force. Hence it is idle to discuss the advisability of rearming the West German Federal Republic, since the maintenance of military forces is the supreme expression of a country's sovereignty.

How erroneous such plans for the rearmament of Germany are at the present time and how many civilian sovereign rights must first be restitued to the West German Federal government is disclosed by a number of characteristic *Control Council Laws and Occupation Statutes.*

Control Council Law No. 2 of 1945 for instance, contains the following provisions in Section VIII :

Paragraph 29 : The German authorities shall place at the unrestricted disposal of the Allied authorities the *entire German domestic transport system (highways, railroads, air and waterways),* all materials and installations connected with it; all repair, building and operating equipment as well as the necessary labour force.

Paragraph 30 : *The manufacture in Germany and the ownership, maintenance and operation by Germans of aircraft* and components thereof are forbidden.

Control Council Law No. 23 of 1946 concerns itself with the prohibition of military building in Germany.

Paragraph 2 : Military installations as defined by the law are all constructions designed to serve belligerent purposes on water, on land or in the air or for the upkeep of armed forces. They include the following items, without completing the list of such works : mine fields, gun positions, rocket-launching stations, anti-aircraft positions, fortifications

and pill boxes, military and civilian air raid shelters, etc., *airfields, telecommunications installations and radio transmitters,* etc., military research and experimental laboratories, etc.

And of even greater clarity to the outsider is the *Statute of Occupation* of April 10th, 1949 :

Paragraph 2 : In order to ensure the fundamental aims of the occupation, special prerogatives are exercised by the Allied authorities in the following fields :

(a) Disarmament and demilitarization, *including such branches of the natural sciences as are connected with military activities, prohibitions and restrictions regarding industry,* and *civil aviation.*

(c) Foreign affairs, including *international agreements concluded by Germany or affecting Germany.*

Understandably enough an attempt was made after the war to prevent Germany from rearming openly or secretly and thus from becoming another menace to peace. To begin with, prohibitions were issued, demolitions were carried out, in short, everything was done to avert such a threat. But by granting a constitution to the West German Federal Republic after a few years and by making certain concessions to this Republic on the basis of this constitution, these laws and prohibitions have been invalidated in part.

Control Council Law No. 2 and its paragraph 29 stipulated, for example, that the domestic transport system should more or less be withheld from operation by the Germans. In contrast, the sovereign rights of the West German Federal Republic today already include the operation of the highways, rail and water ways. That the airways are still out of bounds for the Germans is, to say the least, an inconsistency. We shall revert to it later.

Paragraph 30 of the same Law forbids the Germans to manufacture, own and maintain aircraft. The manufacture of aircraft incontestably belongs to the field of war material production, and the prohibition is comprehensible so long as there is no peace treaty with Germany, which automatically would restore all sovereign rights to the West German Republic. On the other hand, the operation of commercial transport aircraft can hardly be considered as potentially more dangerous than the operation of rail, road or water transport systems. This is another inconsistency, and it becomes even clearer if it is considered that Hungary, Bulgaria and Rumania, all of whom were belligerents on the side of the Axis, today again have their own civil aviation.

An examination of Control Council Law No. 23 and its paragraph 2, which refers to the ban on the operation of airfields, telecommunications systems, etc., shows that also this Law is no longer applied rigidly. A few weeks ago at least seven commercial airports in Western Germany, together with their air traffic control installations, were handed over to the Germans for operation.

The Statute of Occupation of April 1949 prohibits any form of civil aviation activity, including the conclusion of bilateral or multilateral civil air transport agreements. That other former Axis nations again have had their own air transport system for several years has just been mentioned. In the same connection it is interesting to note that years ago already the Republic of Austria, whose willingness or unwillingness to unite with Germany in 1938 is a question that can be debated "until the cows come home," received the right to sign the International Civil Aviation Agreement of Chicago and in 1948 was permitted to join ICAO.

Furthermore, the Occupational Statute of April 10th, 1949, may be criticized also because it purports to restrict Germany's activities in the field of the natural sciences. A thorough application of the Statute would force the German universities to close their doors.

In his recent interview General Clay stated : "... If we create a vacuum in Central Europe, we may be sure the Germans will—as would any other people—seek to escape it, in one direction or another." General Clay refers to Germany as a whole. We, on the other hand, wish to apply his statement to the special case of *civil aviation.*

From the point of view of air transportation, Western Germany today is a vacuum, a no-man's land. To go farther, it is a kind of a jungle in the wilds of which anybody with a gun—or an aircraft—can go hunting and enjoy himself. Today there are at least thirteen airline companies, including the Yugoslav JAT, operating into or across this German no-man's land. In Eastern Germany, incidentally, conditions are similar, with the difference that owing to the smaller air space and the region's minor economic importance only three operators fly there.

What the commercial air services in the West German Federal Republic and in the East German People's Republic look like is illustrated by the three following reports from German sources.

View of the Rhine from the Petersberg Hotel, the administrative headquarters of the three High Commissioners.

The Petersberg Hotel near Bonn, seat of the High Commissioners (Zeppelin photo).

Air Transport over Germany, but no German Air Transport

BY * * *

During the first years after the collapse it was the bombers and fighters of the American, British and French Air Forces which roared by over our heads. On the map of the world's air transport services, covered by a fine net of red lines crossing Continents and Oceans, there was a large white spot : Germany, no man's land of air transport.

This has changed in the last two years.

American and British airline companies have extended their routes into Germany, originally for the obvious purpose of providing a rapid line of communication for the members of the armies of occupation. German air transport needs did not enter into consideration.

Pan American Airways and American Overseas Airlines flew to Frankfurt, Berlin, Stuttgart and Munich ; British European Airways operated to Hamburg, Dusseldorf, Frankfurt and Berlin. Air France seemed disinterested for a long time, because the French Zone of occupation had a direct border with the French mother country, so that airline connections with France did not seem of the utmost urgency. In addition, no major commercial airport was available in Southern Baden and Southern Wurttemberg. For some months now, however, Air France has also participated in air transportation over Germany by flying to Frankfurt, Nurnberg, Munich and Berlin.

Soon enough companies other than those belonging to the occupation powers began to take an interest. The vacuum appearing in Central Europe following the liquidation of the Lufthansa attracted many European operators, particularly those who prior to 1939 had flown numerous routes in cordial collaboration with Lufthansa : the Dutch KLM, the Scandinavian SAS (formed by the Swedish ABA, the Danish DDL and the Norwegian DNL), the Belgian Sabena, Swissair, and finally the Yugoslav JAT.

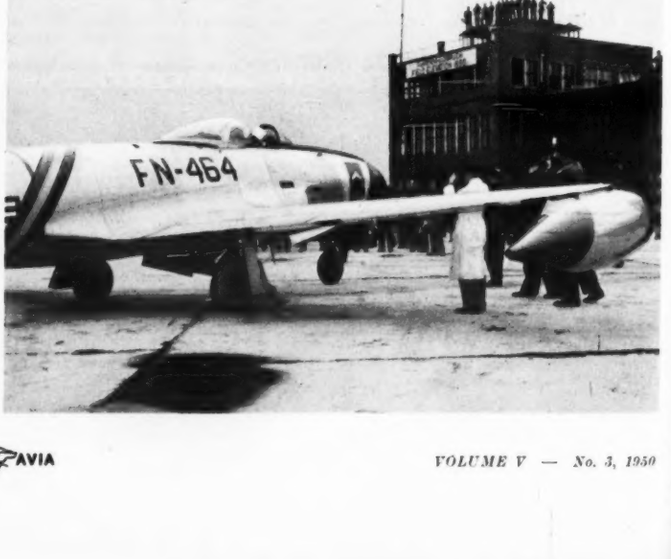
With the approval of the Allied Civil Aviation Boards exercising their jurisdiction in the Western zones of occupation, these companies gradually took the vacant place of the defunct Lufthansa. A network of air services now again links seven principal West German cities, Hamburg, Bremen, Berlin, Dusseldorf, Frankfurt, Stuttgart and Munich, and it also connects Germany with the trunk routes of world air transportation. Airline timetables again show Munich between Montevideo and Nairobi, Stuttgart between Stockholm and Sydney. Again we feel the breeze from faraway continents. We can fly from Hamburg to New York, from Frankfurt to Buenos Aires. *But nobody "flies German" any longer.* Nevertheless, great progress has been made since 1945. The isolation of Germany has been broken, at least in theory, five years after the capitulation of German civil aviation. All the same we do not delude ourselves that the German share in air transportation, including the indirect share, has reached anything like the level of the last pre-war years. For the time being the volume of passengers, mail and freight generated by the seven German

Reminiscence of 1946 : Co-operation by the "Big Four" in commercial aviation over Germany to Berlin : the Frenchman, the American, the Russian and the Briton discuss flight schedules in the building of the former control council.

Foreign air services for Germany... Cologne—New York by the Belgian Sabena.

War is over. German and American aircraft are scrapped at Holzkirchen airfield in Upper Bavaria.

American jet fighters on German airports.



airports is very meager and lags far behind the volume of 1939. A comparison with the 1949 traffic volume of other countries graphically illustrates how far we have fallen back. For during the last decade air transportation in the outside world has developed tempestuously. In the course of this period the volume of passengers, goods and mail carried by the U.S. domestic airlines has increased eightfold. For the first time in 1949 the number of passengers travelling by air exceeded the number of Pullman train passengers. As late as 1938, ninety-six percent of North Atlantic passengers travelled by steamship ; by 1948 forty-two percent travelled by air. In 1938 steamships carried ninety-one percent of North Atlantic first class mail ; by 1948 this figure had dropped to thirty-seven percent.

It is clear that Europe, weakened and ravaged by the war, was unable to keep pace with the enormous progress of the American air transport system. Worse than everybody else fared the defeated, devastated, divided and impoverished Germany.

All the same, the commercial air services in Western Germany would enjoy a more favourable outlook as a result of the currency reform if other obstacles did not interfere with them. It can hardly be said of the German traveller that he is afraid of flying, for the average German is well-educated in the mechanics of flight, loves to travel and would enjoy travelling by air. There are special causes which have provoked this drop in German air traffic volume. First of all there was a kind of dollar clause which was prescribed for German users of commercial air transport. More recently, however, payment in Deutschemark has again become admissible for travellers on domestic German and foreign air services. That special passport restrictions for German passengers still are in force seems to be comprehensible in view of relatively recent events.

Furthermore, it cannot be overlooked that the so-called network of air routes in and across Germany continues to be divided by the Iron Curtain. The air services of American Overseas Airline, British European Airways and Air France terminate at Berlin-Tempelhof. There are no connections to points East. In years gone by, a traveller from London to Moscow transferred to an aircraft of the Russo-German Deruluft company at Berlin. This arrangement does no longer exist. The aircraft of the Soviet state airline land at Berlin-Schönefeld at the end of their Moscow—Riga—Königsberg—Berlin and Moscow—Warsaw—Berlin routes. From satellite countries only the routes of the Polish LOT and the Czech CSA extend into Europe.

German passengers fly from Frankfurt to Berlin by American Overseas Airlines.

As a result of the advance of the Soviet sphere of power towards the West as far as the Oder Line, Germany has had to exchange her position as a Central European power for that of a border area. The Baltic nations have been wiped off the map ; Poland, Czechoslovakia, Hungary and the Balkan countries, with the exception of Greece and Yugoslavia, are now connected to the all-Russian network of airlines radiating from Moscow to the West as well as to the East over the whole of Asia as far as the Pacific shores. Years ago, the air routes from Scandinavia to the Mediterranean intersected those from West to East Europe over Germany. Today Germany no longer is what it was grandiloquently claimed to be : the "hub of international air transportation." It would like to turn towards the West, for it is only through the West German airports that it can reach the gates of the world.

The most important obstacle to the development of air transportation in Germany is probably the fact that the so-called German air transportation at present is operated exclusively by foreign airlines. These arrange their routes, flying schedules and tariffs principally according to their own national customs and interests. German traffic requirements and Germany's economic needs are more or less ignored. Years ago a business executive was able to leave Munich or Stuttgart by air in the morning, arrange his affairs in Hamburg or Berlin and return by the night aircraft. This was a saving of time and money even in comparison to the sleeper train. Today ? Today such a transport system would be doubly necessary, because it is not only money that is lacking, but also accommodation and hotels. But the present flying achedules of the foreign companies make it impossible to accomplish the return journey on the same day. Connections, too, are very bad. Finally, most routes have the disadvantage of not being flown daily but only on certain days of the week. Air services which are not operated

(Turn to page 112)

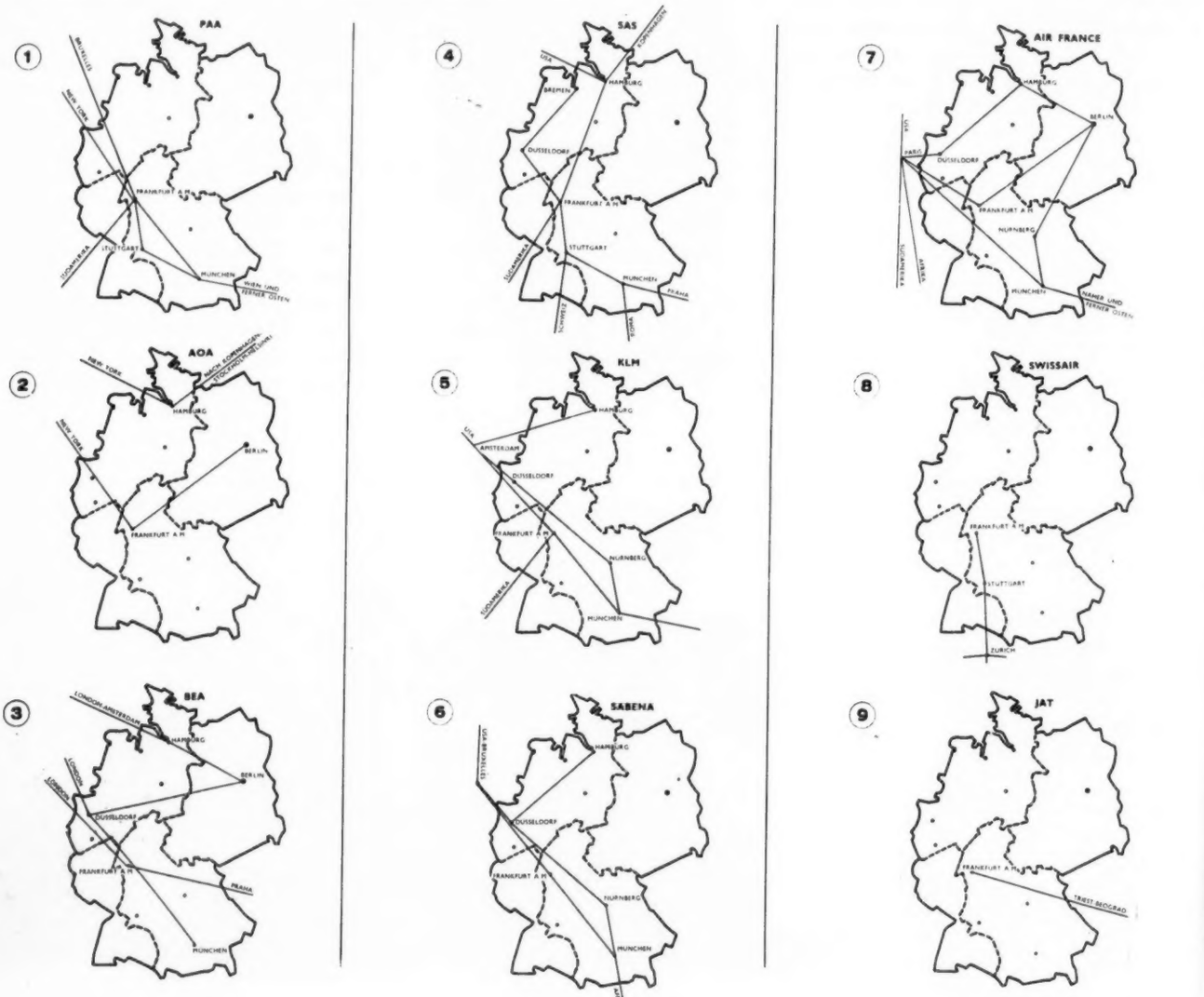
Pan American Airways operates from Stuttgart to Munich. The American crew is welcomed by Dr. Klett, Lord Mayor of Stuttgart.

Air Transport over Germany, but no German Air Transport *

Operator	Head Office	German Routes	Frequency	Connections	German Head Office	Manager for Germany	Route plan
Pan American World Airways (PAA)	New York	Frankfurt—Stuttgart—Munich Brussels—Frankfurt—Munich—Istanbul Frankfurt—New York	13 weekly ? 12 weekly	South America Far East	Frankfurt, Hotel Excelsior ; Offices in all major cities	Peter H. Wenzel, Frankfurt	1
American Overseas Airlines (AOA)	New York	Frankfurt—Berlin New York—Frankfurt New York—Hamburg—Copenhagen—Stockholm—Helsinki	3 daily daily 2 weekly	Points in U.S.A., Mexico	Frankfurt, 12, Bahnhofplatz ; Offices in all major cities	...	2
British European Airways (BEA)	London	London—Amsterdam—Hamburg London—Dusseldorf Frankfurt—London Frankfurt—Prague Hamburg—Berlin Dusseldorf—Berlin Dusseldorf—Munich	daily daily 6 weekly 6 weekly daily daily 5 weekly	Via BOAC to all Continents	Hamburg-Fuhlsbüttel (Airport) ; Offices in all major cities	P. F. Lewindon Hamburg	3
Scandinavian Airlines System (SAS) (ABA, Stockholm ; DDL, Copenhagen ; DNL, Oslo)		Copenhagen—Frankfurt—Hamburg Frankfurt—Stuttgart—Munich Bremen—Dusseldorf—Frankfurt	daily daily 3 weekly	Scandinavia, USA, Switzerland, Far East, Austria, Southern France, South America, Africa, Italy	Frankfurt, 32, Hansaallee ; 3 Branch offices in Frankfurt ; Offices in all major cities	P. Heiberg-Christensen, Frankfurt	4
KLM Royal Dutch Airlines	The Hague	Amsterdam—Hamburg Amsterdam—Dusseldorf—Nurnberg—Munich Amsterdam—Frankfurt Amsterdam—Frankfurt—Munich Amsterdam—Frankfurt—Munich—Vienna	2 weekly 3 weekly 1 weekly 1 weekly 1 weekly	North and South America, Indonesia ; Hamburg-Frankfurt or Munich : direct services planned	Frankfurt, Hotel Frankfurterhof ; 3 Branch offices in Frankfurt ; Offices in all major cities	H. Laponder, Frankfurt	5
SABENA	Brussels	Brussels—Dusseldorf—Nurnberg—Munich Brussels—Dusseldorf—Hamburg Brussels—Frankfurt—Munich	2 weekly 4 weekly 2 weekly	North America, Congo and South Africa	20, Cäcilienstr., "La Maison Belge," Cologne ; Offices in all major cities	Raymond Hody, Cologne	6
Air France	Paris	Paris—Frankfurt—Berlin Paris—Munich—Nurnberg—Berlin Frankfurt—Berlin Paris—Dusseldorf—Hamburg—Berlin (projected)	2 weekly 2 weekly daily 2 weekly	To all Continents	7-8 Hauptwache, Frankfurt ; Offices in all major cities	Max Jourdan, Frankfurt	7
Swissair	Zurich	Zurich—Stuttgart—Frankfurt	5 weekly	Spain, Portugal, Near East, USA	42, Arndtstr., Frankfurt ; Office in Stuttgart	Chr. Signorell, Frankfurt	8
JAT, Yugoslav Airline	Belgrade	Belgrade—Trieste—Frankfurt	2 weekly	...	Repr.: Monsieur O. Azucki, 108, Oberlinden, Frankfurt	...	9

Projected : Panair do Brazil : Rio de Janeiro—Stuttgart—Frankfurt.
Approved non-scheduled carriers : Seaboard & Western Airlines (USA) ; Transports Aériens Intercontinentaux, TAI (France).
IATA office for Germany (IATA Agency Investgation Board) : 4, Mainlustrasse, Frankfurt ; Head : H. K von Winterfeld.

* Data as of 30th March 1950



Frankfurt (Rhein-Main)

German Commercial Airport Working Committee

11, SAARLANDSTRASSE, STUTTGART

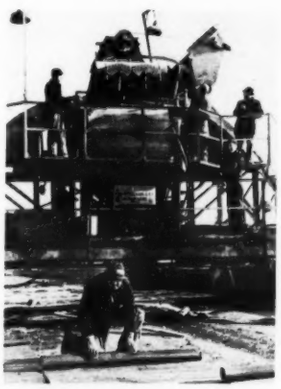
Name	Distance from City	Runways	Facilities	Served by
Bremen	2.2 miles from centre	4	Administration building, hangars, maintenance facilities	SAS
Frankfurt-Rhein-Main	5.3 miles SW of centre	2	Northern part for civil air services, southern part for USAF. New one-storey administration building, some maintenance facilities	PAA, AOA, BEA, SAS, KLM, Sabena, Air France, JAT, Swissair
Stuttgart-Echterdingen	6.2 miles from centre	1 being extended to 5,900 ft.	Administration building and maintenance facilities	PAA, SAS, Swissair
Munich-Riem	6.2 miles from Central Station	1 6,600 × 200 ft.	Administration building and maintenance facilities	PAA, BEA, SAS, KLM, Sabena, Air France
Hamburg-Fuhlsbüttel	5.6 miles N of centre	1 6,160 × 150 ft.	Administration building, hangars, maintenance facilities	AOA, BEA, SAS, KLM, Sabena, Air France
Dusseldorf-Lohausen	Northern city limit near Cologne highway	1 6,000 × 155 ft.	Administration building and maintenance facilities	BEA, SAS, KLM, Sabena, Air France
Nurnberg	—	—	—	KLM, Sabena, Air France
Berlin-Tempelhof	Berlin-Tempelhof district	3 5,250 × 140 ft. 5,580 × 120 ft.	Administration building, covered gates, workshops, 7 hangars	AOA, BEA, Air France

Hamburg-Fuhlsbüttel

Munich-Riem

Berlin-Tempelhof under construction

Work going on at Rhein-Main Airport



Swissair flies from Zurich to Stuttgart and Frankfurt. Here again the Lord Mayor of Stuttgart welcomes the first aircraft flying the route.

(Continued from page 109)

every day hardly merit the name of "air transportation."

In any discussion of such weaknesses, another economic drawback arising out of this constellation cannot be ignored : the revenues accruing to foreign airlines from the carriage of German passengers, mail and freight are lost to Germany's economy without a trace as an "invisible export." This is another contradiction to the aims of the Marshall Plan and belongs in the same category as the belated dismantling of German industrial plant. On the one hand, Germany is to become independant of foreign help within the shortest possible time ; on the other hand, Germany's economy is being shackled because its resurrection is feared in certain quarters. Does not the same apply to air transportation ? Perhaps the disappearance of the German Lufthansa suited some of the foreign airlines more than they would like to admit.

It is clear that civil air transport policy as practiced in Germany by the Allies is still influenced by a certain amount of resentment over past events. Abroad the Lufthansa is still regarded as the original nucleus of the Luftwaffe. This is inevitable. Air Minister Goering never finished talking about this rôle of German air transportation, which had not been in the intentions of the original creators. What does it help to know that those one-hundred-and-fifty lumbering three-engined transports of the Lufthansa were useless for modern combat operations ?

Now politics is the art of accomplishing what is possible. This also applies to aviation politics. And if for once we wish to make use of this art in a reasonable manner, we have to take great care in our demands for restitution of sovereign rights to our air space. If a number of old Lufthansa Captains shouted at a recent Berlin meeting, "We want to fly again !", they were probably guided by the wish to make a living once again in their old trade, and from this angle their sentiments are understandable. But such a demand also shows a complete lack of political insight. The only result they can produce is new suspicion.

It cannot be disputed that the present status of the West German Federal Republic shows certain discrepancies. On the one hand, the Republic alone is authorized to legislate in the field of air transportation. To make it even more clear : the Federal Ministry of Transport would in theory have to regulate Germany's air transport system. Yet, it is the three High Commissioners who exercise sole power over civil aviation in Western Germany. To this fact it is attributable, for example, that without consultation of the German authorities an air transport agreement was concluded by Washington and Belgrade under which the Yugoslav airline JAT was granted traffic rights in Germany, among other things. The German Federal Government or rather the Federal Transport Minister received news of the agreement when he opened the newspaper one fine morning . . .

The only asset left to the Germans after the collapse of German aviation are the commercial airports. They, too, were and are subjected to the control of the occupational powers, but at the present time they are the only focal points from which a German air transport system could start its revival and development.

The expansion of these airports has devoured millions since 1945. Some of the money came from the budgets of the individual German states and some from the municipalities ; another portion was charged to the occupation account. So far this expansion has taken place exclusively with a view to satisfying the military and traffic requirements of the occupational powers, and it has obviously been more expensive than it would have been under German management. True, these gigantic installations, long runways, approach lighting and other equipment will remain in Germany, but they are a present which we have had to pay for largely out of our own pockets. From the German point of view the only expenses which are justified today are those serving commercial aviation. It would seem to be only just, therefore, that future airport planning and expansion should be carried out in consultation with the competent German authorities and for the sole purpose of improving the civil air services.

The Commanding General of the U.S. Air Force in Europe, Lieutenant General John K. Cannon, on November 25, 1949, handed over Rhein-Main Airport, Frankfurt, to civilian administration. Next to the General is the Director of the U.S. Civil Aviation Division in Germany, Thomas D. Johnson.

It is due to this conviction that two years ago the airport operating companies of the Western zones joined in a German Commercial Airport Working Committee *(Arbeitsgemeinschaft Deutscher Verkehrsflughäfen)*, with headquarters in Stuttgart. The group is headed by Dr. Klett, the progressive Lord Mayor of Stuttgart, the executive secretary is Herr Zobel. The working committee has made it its aim to represent the mutual interests of the airports and, as soon as possible, to assume responsibility also for the overhaul, maintenance, servicing and despatching of transport aircraft, as well as for the air traffic control services.

We consider it as encouraging that certain progress in this respect has already been made at least in the American Zone, where definite agreements habe been concluded under which fruitful and understanding collaboration will be possible between Americans and Germans.

Life at an Airport behind the Iron Curtain

BY * * * *

Russian soldiers before the Victory Monument in Berlin.

Our correspondent in the East German People's Democracy writes from Berlin :

The factory pilots of the Henschel aircraft manufacturing concern who during the war tested new aircraft at Schönefeld airfield, near Berlin, would have difficulty in recognizing the place today.

In the past two years the Russians have erected enormous buildings in the place of the small hangars. New runways have been constructed, and amidst carefully tended lawns there is an "Intourist Hotel" for foreign air passengers. A guest-house waits to receive the "Very V.I.P.'s," as an calls describes the unusually prominent Soviet personalities arriving at the airport.

Schönefeld, which the Russians describe as one of the most modern facilities of its kind in Europe, is the only airport serving the commercial air routes between Berlin and the East. It is located about twenty miles southeast of the four-power city.

The Russian state airline, Aeroflot, has established its offices there. At 06.45 hours every morning a twin-engined Iluyshin IL-12 airliner takes off for Moscow—"in any weather, for we have the world's best pilots," as one of the Russian captains assures us—and arrives in Moscow six-and-a-half hours later. The service is flown alternately via Minsk, Warsaw or Kaliningrad (formerly Königsberg). The number of passengers is usually limited, much to the regret of the airport commandant, Colonel Ribrov. On the other hand, between 1,000 and 1,300 pounds of freight and mail are loaded every day.

Senior Soviet and German Party functionaries normally use special diplomatic aircraft which are also handled by Schönefeld. Last time Soviet Foreign Minister Vishinsky landed at Berlin's Schönefeld the fences, which even in normal times are quite respectable, were doubled. The East German customs officials were not allowed to set foot on the field. And Foreign Minister Vishinsky descended at the guest house which an ordinary mortal never has a chance of seeing from the inside.

This guest house is worthy of special mention. Situated inside the airport boundary, it is surrounded by an extra barbed-wire fence. It is usually empty, but its forty rooms are said to be much more comfortable than those of the Intourist Hotel.

Colonel Ribrov has obviously succeeded in adapting the accomodation of the new Intourist Hotel to the tastes of the West, an adaptation which, according to his own words, he has been desperately keen to achieve. Even though the waiter, when asked for a napkin, regretfully declares that money must be saved and that the management issues serviettes only on the most extraordinary occasions, a compliment is due to the architects and chiefly to the interior decorators. The "Red Lounge" with its genuine Persian carpets and its deep arm chairs may have turned out a little too red (the delicately pink lampshades look completely anaemic in comparison), but you clearly get the impression that the place was designed to compete with the capitalistic West. The "Blue Lounge" even has a bar with large quantities of chromium, but the barstools are late in delivery. The rooms are well furnished and equipped and cost about 17.50 Eastmark a day, which is equivalent to about 2 Deutschemark.

The prices charged in the restaurant are exorbitant for an East German. But for the four crew members and the air hostess of the Swedish S.A.S. aircraft which today is prevented by bad weather from flying on to Leipzig they are trifling. Caviar sandwiches cost 6 Eastmark and a bottle of excellent Rhine wine costs about 25 Eastmark. In West German money this is about 0.80 and 3.50 Deutschemark, respectively. And the greatest concession to the West stands in a corner : a grandfather clock with a Westminister chime. It shows Russian time and therefore is two hours ahead of Central European time. This grandfather clock really forms a link between peoples : western in make, it is eastern in operation.

Berlin-Schönefeld, the gateway to the east, is served also by the Polish LOT and the Czech CSA. LOT uses Douglas DC-3s or IL-12s for 28 passengers. The Berlin—Warsaw trip costs $35.00 and takes an hour and forty-five minutes. A schedule is flown twice a week. The line carries very little traffic, since the currency and visa difficulties for East German travellers are considerable. Freight charges may be paid in Eastmark. A Douglas DC-3 lands from Paris, eight persons get out. Three of them continue their trip to Leipzig by bus whereas the other five will go on to Warsaw.

CSA's flying schedule.

A twin-engine IL-12 of the Czech CSA.

Czechoslovakia's CSA also is infected with the "airsickness" of the People's Democracies : lack of passengers. "No airline can stay alive like that," says a senior German official. Wednesdays and Fridays an aircraft leaves for Prague, with a connection to Sofia and Bucharest. The Berlin—Prague fare is $27.00.

Long ago Berlin was called "the aerial crossroads of Europe." That dream is out for the time being. Between the international flights serving Tempelhof in the American sector and Gatow in the British sector there is no point of contact whatsoever, no co-ordination of schedules. You can't get a transfer ticket to the east . . .

They Talk about German Air Transport again

BY * * * * *

This title, the writer admits, is deceptive. Who speaks of German air transport today ? Their excellencies, the High Commissioners ? Of course not. The German public ? Perhaps it dreams of it once in a while but it doesn't speak of it. A few weeks ago a Frankfurt travel agency chartered an old "Dakota" from the Scandinavian Airlines System to conduct a series of pleasure flights over the city. The travel agency made more money that day than at any other time of the year, and the crew was wrecked in the evening. The passengers, each with fifteen Deutschemarks in his hand, queued up from early in the morning until late at night.

A promising outlook for a potential German airline system . . .

Dr. Ing. Hans Christoph Seebohm, Minister of Transport in the West German Federal Government, shortly after his appointment repeatedly made known his views on the possibilities of a future resurrection of German air transportation, and he carefully avoided

Dr. Hans-Christoph Seebohm, Federal Minister of Transport.

any reference to possible German air operations outside of the country. The first time he spoke as a member of the "Deutsche Partei," and what he said on the party platform was clear and optimistic. On November 18, 1949, he enlarged upon his declaration at a conference of the State Transport Ministers in Berlin. With a statesmanlike flourish he pointed to the "fundamental right of a nation to exercise full control over all branches of transportation." The Allies should at last show their confidence in the German people, he stated, and it was wrong to consider air transportation as a cloak for concealed military activity.

Two weeks earlier, it is true, Allied circles in Frankfurt had pointed out that German plans for the re-establishment of a German civil airline system would not meet with

Professor Frohne, Under Secretary of State at the Federal Ministry of Transport.

Dr. J. Hubener, Civil Aviation Adviser at the Ministry of Transport.

approval. Nevertheless, the United Press report on the incident ended upon a note of consolation : it might be conceivable, it said, that the High Commissioners would ultimately modify the regulations governing civil aviation in Germany. The question is, of course, when ?

It never rains but it pours. After the Minister had made an official and a semi-official pronouncement and the United Press, as a semi-official mouthpiece, had somewhat dampened his enthusiasm, two private individuals reappeared from limbo to make sure that their names would not be forgotten. Professors Ernst Heinkel and Willi Messerschmitt delivered oracular declarations in Stuttgart and Dusseldorf. Heinkel stated plaintively that a German aircraft industry was an impossibility for years to come, as only the United States and the Soviet Union possessed the physical means of keeping such an industry alive. From an industrial point of view Germany had missed the connection. But Germany could not forever be deprived of her own air transport services, though these might be on a limited scale. His pal Messerschmitt made two contradictory announcements : on November 3rd, 1949, he advocated the resumption of aircraft manufacture in Germany. By November 28th he had thought it over and was against it.

In view of the country's present political and economic situation such statements by former German aeronautical engineers are not necessarily of outstanding significance.

It would be of much greater interest to know what the Under-Secretary of State for Transport, *Professor Frohne,* or his subordinate, *Civil Aviation Adviser Dr. Hubener,* think about the possibility of future German civil air transport operations. Both are economists and transport experts, both are extremely reserved in their utterings, and thus it is very difficult to divine their real opinions. Frohne, a man of mature age, professor of transport sciences at Brunswick University, is internationally well-known as a railroad expert. The management of the Swiss Federal Railways recently enlisted his services as a consultant on the projected reconstruction of the Zurich central station. Dr. Hubener, the Adviser on Civil Aviation, is about forty years of age, also won his spurs with the railroads, but seems to have familiarized himself quickly and thoroughly with the problems of air transportation. In certain tempestuous circles he has meanwhile lost some of his popularity because he made it very clear that if a German airline company were ever to be reestablished this would certainly not become an institution for over-age pilots. New aircraft and new men. This sounds like common sense.

These men, who will be responsible for Germany's future civil aviation—and who would doubt that Germany will have her air transport system again one day ?—do not appear to be nursing extravagant plans.

To begin with they envisage a domestic German network of airlines without ambitions of immediate world significance. This network would roughly resemble that formerly operated by Lufthansa, a name now banned abroad and tabu at home. In the Western zones they would establish a four-cornered system of high-speed services, the corners

Germany's domestic air routes ?

being Hamburg, Frankfurt, Munich and Berlin. Cross-lines would connect major economic centers like Cologne, Dusseldorf, Hanover, Stuttgart and Nurnberg. Luxury services would not be flown but merely a number of utilitarian, economic domestic "aerobus" schedules.

An airline system of this kind could be operated with a dozen modern twin-engine aircraft, and since distances like Munich—Hamburg measure 370 miles and Hamburg—Frankfurt 310 miles, they would result in a considerable saving of travelling time. A high frequency of day flights plus a number of night schedules would probably generate an adequate traffic volume. The German traveller today has to depend on a small number of express trains of inferior quality and relatively low speed ; the German post office authorities insist on better travelling times ; and German air cargo traffic has disclosed itself to be a rich source of revenue for the foreign operators.

People who fly or want to fly.

Judging by rumors circulating in Germany, there would be no intention to emphasize the national character of such an airline system. Foreign participation would be agreeable, and active collaboration with the French neighbour would be welcome. This would be in line with the Adenauer government's general policy, which is making obvious efforts to overcome the suspicions of the Western neighbour by practical and beneficial collaboration.

It is conceded that it would be premature for Germany to plan the operation of long-range overseas services. But German experts believe, that German domestic air services would represent a first step, a proof of Germany's trustworthiness, and that the great foreign airlines would continue to be fully capable of providing adequate service on the overseas trunk routes. With a certain amount of justification the opinion is expressed that the West German Federal Republic and its population of nearly fifty million, to whom certain sovereign rights have already been restored, should now also be given back one of the major rights without which a modern economic system is no longer thinkable.

Between the Potomac and the Moskva

General Clay, Winston Churchill, Henry Luce—to mention only three—quite openly discuss the possibility of rearming Germany. Why should one not be able to debate the possibility of German commercial air transport ?

An attempt has been made in the preceding pages to show in what problematical circumstances the West German Federal government of Bonn is functioning today. We have published experts from Control Council Laws and statutes and endeavoured to illustrate why they should be re-drafted since in some respects they have been invalidated anyway. German nationals have contributed to this series to explain their own cause.

Clay and others believe that is would be harmful to create a vacuum in Central Europe, as the Germans—as would any other people—would seek to escape in one direction or another. The story on "Air Transport Over Germany—But No German Air Transport" describes one aspect of this no-man's land. Must we recall that certain things were withheld from the Weimar Republic which later on were offered to the Third Reich on a silver platter ?

The time is near when Europe and the world must decide whether or not Germany, "severed occupied, impoverished, sick of soul and torn of body," should be led back into the European family of nations. The solution of this problem is the key to a better world economy and better world politics.

Let us take a look at the map. The White House is situated on the banks of the Potomac, the Kremlin on the Moskva. It is true that the two are separated by an ocean, by the Atlantic Pact nations and the so-called Eastern Satellite countries. Between them lies, above all, a field of evil tension and in its center that no-man's land called Germany. If it is forced to stay in no-man's land, it will become a menace. It has proved this before.

We believe that it is idle, premature and even dangerous to discuss plans for a German rearmament. We agree with Clay and Henry Luce that this rearmament will take place at some future date. But we also believe that it would be good policy to begin with Germany's spiritual and moral rehabilitation. By returning to the Germans certain sovereign rights, which are essential to the self-confidence and self-respect even of the smallest nation, a start could be made with this rehabilitation. These fundamental sovereign rights include sovereignty over the air space. *EEH.*

* * *

The Sad Story of the Broken Pipe Dream

Germany's first *known* postwar aircraft—*unknown* things may be going on in different parts of the country—is doomed to corrode into oblivion without ever making its second trial flight. Once, a few months ago, the spidery helicopter, which looks like a pre-Wright Brothers nightmare crossed with George Washington's perambulator, soared aloft—but more about that anon. Unless something unlikely happens, the Iron-Pipe Special will resignedly await its rusty fate, regardless of its inventor's astounding claims. A fact which, apparently, ought to be regretted. For, does not the contraption rise quicker and higher, fly faster forward, backward and sideways then any of its species in America, England and France ?

The case is known as the Sad Story of the Broken Pipe Dream, chiefly because iron pipes form the contraption's main ingredients. Also because once it broke up, as did the dream on which it was built. The dream was that of a German aircraft mechanic who decided to build a rotary-wing aircraft capable of soaring to entirely unprecedented heights—high enough, in fact, to fly right over Paragraph B of Article III of No. 23 Military Government Law. This law is simple and precise : it makes it illegal for Germans to build flying machines capable of flight and power plants to power them.

Walter O. Galonska is the 45-year old dreamer. Probably he thought that this law, just like any other law, *must* have a loophole. Zestfully he collects an assortment of different lengths of pipe, a few wheels, an automobile engine complete with radiator. He buys or orders three large rotor blades of laminated wood, at a cost of 380 Deutschemark apiece. He carts his hardware to a disused shed of the firm of Roeder, in the outskirts of Frankfurt on the Main. For several months he works, putting the stuff together, sawing bits of pipe, filing gears down to size.

Whipping iron pipes together doesn't feed a man. Galonska begins to deal in second-hand cars, uses some of the profits to keep himself alive and some to buy more pipe. At night he labours on his dream.

One day last June Galonska begins to feel uneasy. Or so the story goes. What if the freak does take off ? What will the Yankees say ? Off to the telephone he rushes to call a subaltern of the U.S. Air Force, Lieutenant Callman. Or so the story goes. "I've built something interesting," he says, "come and take a look." Lieutenant Callman comes and looks. "Yes, what is it ? Helicopter ? Ha, ha, it won't fly." Telephone again. Callman calls Captain Edgar W. Gregory, also of the U.S.A.F. "Guy by the name of Galonska built something funny. Says it's a helicopter. No, it won't fly. Come and see."

Captain Gregory arrives on the scene. Or so the story goes. More belly-laughs. "You think she doesn't fly ?" says Galonska, "I'll show you." "Please don't," says Gregory, who hates the idea of sudden death. An engine sputters, a raucous noise, and up goes the pipe dream. The controls apparently are not very effective, the contraption hits the iron girders under the roof of the shed at an altitude of fifteen feet. Down it comes at an alarming rate. Crash—silence. Galonska brushes the dust off his pants. Injury, none. Damage, three times 380 Deutschemark, or 1140 marks worth of rotor blades. Captain Gregory calls the U.S. military authorities of Hessen on the telephone. "Guy here built a helicopter. No, doesn't fly. Okay. 'Bye." The authorities close both eyes and keep mum. Or so the story goes.

Walter Galonska starts all over again. He is used to hard work. During the war he did his best for the Junkers aircraft concern, including overtime. On April 2nd, 1945, he arrives in Moscow by air as a "voluntary" worker. A week earlier the Ivans found him in Breslau working on some component of a pilotless aircraft. So he force-volunteers for Moscow, where he is given a three-month contract to work for the good of the mother of all democracies. He is shipped to Sverdlovsk and stuck into a work camp ; but he enjoys a certain amount of freedom. After three months he asks for his contractual leave. "Nothing doing," he is told by one of the Workers of the World, in Russian, of course, "anybody who's any good around here *stays* here." Galonska's output sinks rapidly. He is not so good anymore. But he still stays at Sverdlovsk. Three years later he manages to escape. In the autumn of 1948 he arrives in Frankfurt, planning to build a helicopter. He had worked on Russian helicopters at Sverdlovsk and learned something.

After the crash in the shed Walter Galonska, as we just said, begins to rebuild his freak. It is "ready" again by the end of last of October. Galonska plans to take it to Wiesbaden, headquarters of the U.S.A.F. in Europe, to demonstrate it, suitably equipped with a parachute, before a number of American officers. A German newspaper reporter discovers the secluded shed—writes an enthusiastic blurb about Germany's first postwar aircraft. On the morning of October 31st the U.S. Attorney-General or whatever he is called in Frankfurt, finds a newspaper clipping on his desk. "FIRST GERMAN POSTWAR AIRCRAFT BUILT IN FRANKFURT." "What's this ?" says the Attorney. "It's against the Law. No. 23, Article III, Paragraph B."

In December, 1949, Galonska finds himself before the American District Court in Frankfurt. Witnesses are heard, the Sad Case of the Broken Pipe Dream is properly tried. Maximum possible penalty, quod for life and 500,000 Deutschemark fine. Things look black for Walter : the U.S. military authorities say they never heard of him... This is comprehensible. Walter Galonska, you see, refused to give the names of the American officers he had contacted. Of the officers who had "authorized" him to build his dream. The court adjourns.

January 6th, 1950, verdict and sentence. Verdict, guilty. Sentence, six months, suspended. On condition that Galonska refrains from engaging in aircraft construction or research work as long as the law forbids it.

That is how the Galonska iron pipe dream comes to rust in a disused shed. And this is the end of the Sad Story of the Broken Pipe Dream. Or nearly. For on the next day the German press reports that a certain Herr Günther C. Kämpf, reputedly an aircraft designer working at Darmstadt institute of technology, a nephew of Luftwaffe-Marshal Kesselring, has completed the designs for a "flying automobile." Will he be hauled to court ? Nobody knows. He can always claim that his invention is not an aircraft, merely an advanced means of surface transport. Equipped to fly over the traffic lights when they're red.

The morale of the story ? Not much. The flying spider wouldn't have done any military harm. It hardly flew. It couldn't carry the hydrogen bomb. But Western Germans mustn't even build powered boxkites. To some people this could be a pretext for saying that a gigantic aircraft industry was growing up in the Western Zones. Suitable "retaliatory measures" would then be justified...

Progress in Pictures

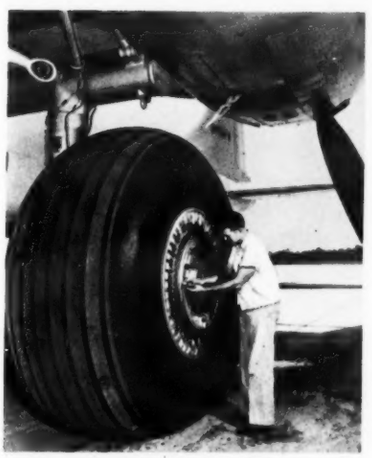
Neptune Expands his Empire

For several years the twin-engined Lockheed P2V "Neptune" has been regarded as an outstanding long-range reconnaissance and patrol aircraft. Two new versions have now been disclosed. The U.S. Navy has equipped one experimentally with skis which surround the undercarriage wheels and are retractable with the latter. This enables the

aircraft to land as securely on the expanses of snow and ice in the Arctic as on concrete runways and aircraft carriers.—At right is shown the P2V-4, the latest production model, which is equipped especially to combat the submarine menace. Its highly sensitive radar instruments register even "schnorkels," the submarines' small breathing apparatus floating on the surface of the sea. In addition the P2V-4 carries the novel "Sonobuoys" which are dropped into the sea, automatically immerge listening apparatus to the desired depth and by radio report any sound emanating from a submarine to the search aircraft.

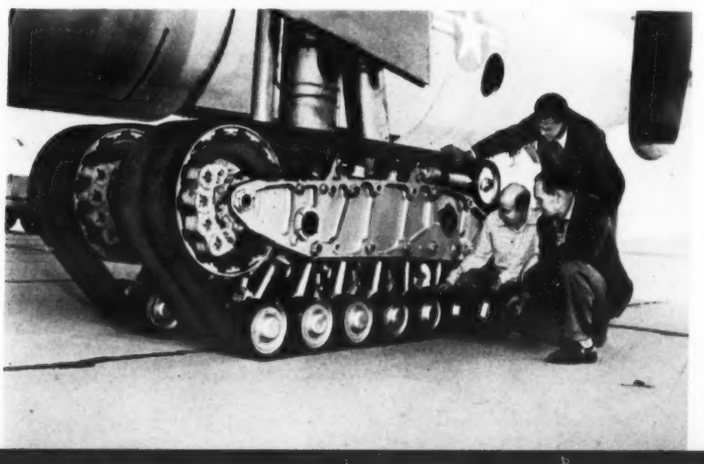
A New Parachute

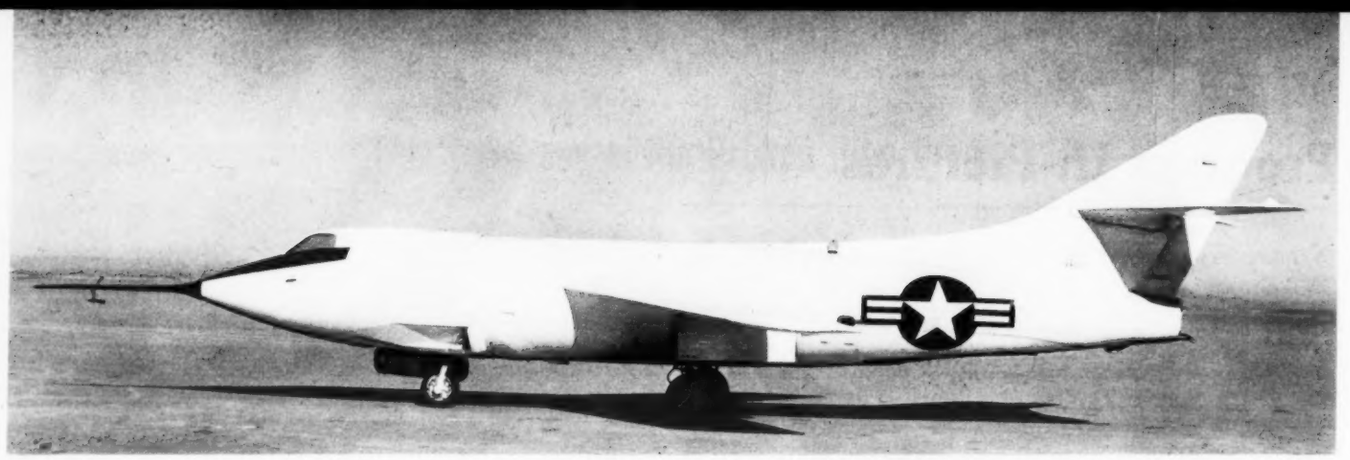
In spite of numerous disadvantages and vastly extended use for a variety of purposes, the shape of parachute canopies has changed only very little over the past few decades. The U.S. Navy has now succeeded in greatly reducing the pendulating movement of parachutes, a highly undesirable phenomenon which presents considerable hazard near the ground, by developing a new canopy shape with a constricted edge. In addition this design offers lower rates of descent than conventional parachutes.



To a Logical Conclusion...

To design the landing gear of the 160-ton Consolidated Vultee B-36 giant bomber in such a way as to ensure that the wheel pressure does not exceed the carrying capacity of existing concrete runways was just as difficult a problem as to keep the take-off and landing runs of the aircraft within the limits of available runway lengths. Whereas the prototype of the B-36 had only two main wheels measuring 110 inches in diameter (picture at left), today's production model is equipped with eight main wheels of 56 inches' diameter for better load distribution (picture at right); as a result, the aircraft can operate from a considerable number of aerodromes all over the world. Why not bring this development to its logical conclusion ? The United States Air Force has done so quite recently by experimentally fitting the XB-36 prototype with a caterpillar landing gear (below). The pair of nose wheels of the standard type has also been replaced with a caterpillar.





The U.S. Navy's Douglas D-558-2 "Skyrocket" supersonic research aircraft.

The Wall Hat wasn't Here

BY SCHOLER BANGS, LOS ANGELES

Standing on Muroc Dry Lake under the sun-bleached blue of the winter sky, one accepts with difficulty, at first, the commonplace illusions of the Mojave Desert.

Wherever you look, an unseen crystal lens is before your eyes.

The hangars of Edwards Air Force Base, bordering the western rim of the glistening, flat lakebed, appear to be within strolling distance of the 25,000 ft. east-west runway beside which you are standing near the lake's southern shore. You wonder why the jeep, approaching from the hangars, moves at such a snail's pace. The hangars are five miles away!

Desert peaks you know to be thirty miles distant seem to crowd in upon the surrounding landscape of sage and bristling Joshua trees.

Directly east, in a continuing line with the black asphalt dots marking the course of the five-mile runway, Haystack Butte erupts from the desert floor.

It is to be an important landmark, and you have the feeling that, with a half-hour or so at your disposal, you would like to wander over and explore its rugged slope and storm-torn canyons.

Haystack Butte, you are informed, is fifteen miles away.

These things pass through your mind, while you are waiting, because it is impossible to anticipate just what it will be like to see the arrow-winged Douglas "Skyrocket," the U.S. Navy's supersonic D-558-2, flash past at a speed faster than that ever before witnessed by a civilian group.

You just soak in the vastness of the scene and increasing warmth of the late morning sun, and wait.

This will be it, the run.

Twice before Pilot Gene May passed by where we were standing half way down the runway; and twice he had announced his coming.

First with the combined whine and roar of the "Skyrocket's" turbojet beginning the takeoff roll; the succeeding sharp explosions

Prior to its start, the "Skyrocket" is thoroughly checked in its "portable service station." Here it simulates fuel jettisoning. Smoking is, of course, prohibited. To take the aircraft aboard, the service trailer "kneels" at rear wheels while winches roll the "Skyrocket" up the ramp.

There she goes.—The take-off is assisted by a battery of JATO rockets.

of No. 1 and No. 2 (of four) take-off rockets. Tiny against the expanse of the lakebed, the dazzling white plane had picked up speed fantastically under the push of the rockets and near our station had lifted off the surface at an alarming angle, settled as if in a stall, and then leveled off in eye-level flight as it thundered past.

Then, against the sheer backdrop of Haystack Butte, the widely circling "Skyrocket" had banked lazily, dipped earthward, and aimed its lanced nose toward the red plume of signal smoke twisting skyward from the head of the runway.

This was the turbojet run. No rockets. Just an "indoctrination" pass over the runway at some 650 miles an hour to enable newsreel and newspaper cameramen, at the far end of the runway, to focus their cameras for the all-out, full-power dash to follow.

The seconds dragged by as the plane grew in size, and ahead of it came the tell-tale shrill whine of the turbojet. There was time to study the beautiful symmetry of the plane; time to catch a brief glimpse of the white oval of May's helmeted head behind the small angular windows of the cockpit canopy.

Now would come the proof of what May had hinted two weeks earlier when he had failed in an attempt to show what the "Skyrocket" could do.

Then, on his takeoff roll, his rockets had misfired and in the midst of brutal cannonading May aborted his takeoff, struck his emergency cut-off switsches and coasted past at a terrifying 180 miles an hour. Apologetic, he had promised to try again after an overhaul of the recalcitrant rockets.

A newspaper reporter had popped the tabu question, then, and May answered.

"What's it like, going through the 'sonic wall' ?"

Gold-braided Navy officers, flanking the stocky Douglas test pilot, didn't so much as raise an eyebrow at the question which had been officially parried ever since Air Force Captain Charles Yeager had flown faster than sound in the XS-1 two years earlier.

May answered:

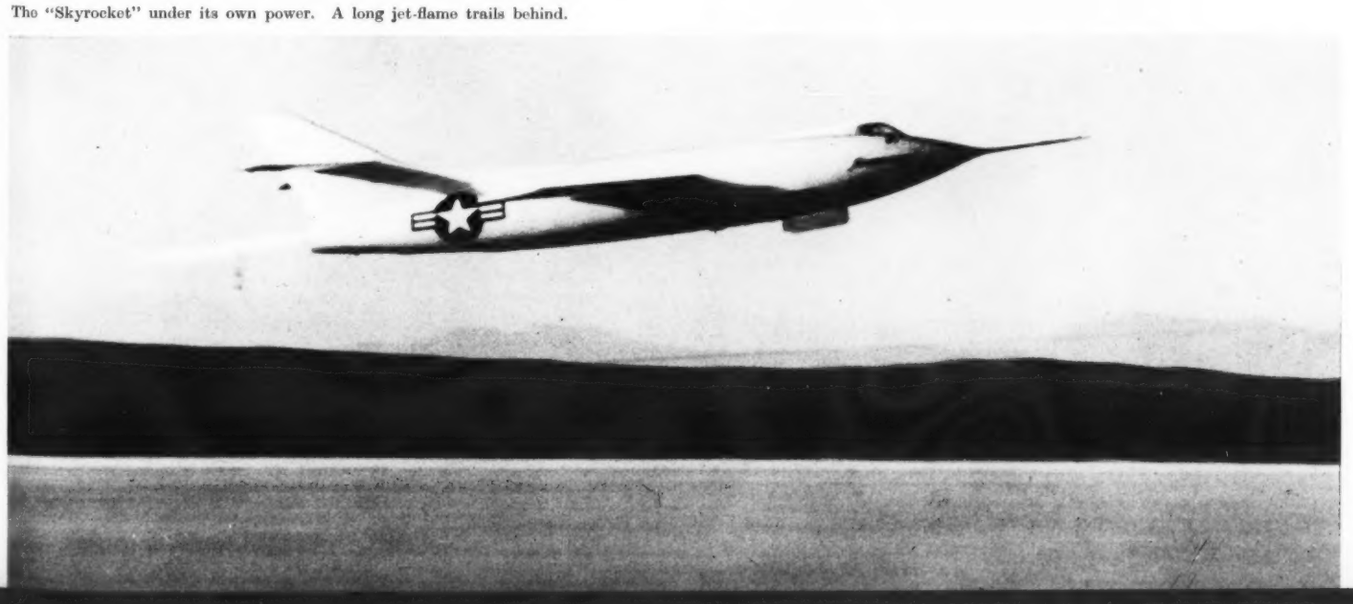
"Lets get this straight. There is no 'barrier' to the properly designed aircraft. Going through the transonic is no worse than like flying through a slightly turbulent air mass. When you are on the other side you know it because your flight is smoother. Its not a rough ride. I wouldn't even need to wear this crash helmet going through."

Thurston the Great could not have conceived a more perfect illusion than that which had attended man's two years of supersonic flight.

Picking up speed. The two outboard JATO rockets are fired.

Aviation's green pasture of supersonic flight, a realm of vast calm and limitless speed, had been portrayed as lying on the distant side of an impenetrable "barrier" standing at the borderline of 760 miles per hour at sea level. A pilot trying to pierce it would find himself in violent trouble. His plane probably would start unpredictable gyrations, pitching downward one instant in a "tuck-under" and climbing wildly the next. Trip-hammer buffeting would tear at the wings. Even if a pilot could survive the spine-crushing ordeal there was a good chance that under such stresses his plane might disintegrate, that it might literally explode, as if it had been flown headlong into a brick wall.

The "Skyrocket" under its own power. A long jet-flame trails behind.



Test pilot Gene May after the flight. To get out, he lifts padded canopy of "Skyrocket."

Thus the illusion, "Sonic Barrier," and the popular headline, "Pilot Crashes Through Sonic Wall."

"No wall," May had said. And he was about to prove it, again.

"Thirty seconds !"

The control truck voice barking from the loud speaker nearby was flat and harsh upon the echoless desert.

Beside me Clete Roberts, the radio news broadcaster, fingered a switch on the side of the leather-clad case which swung at his side and held the mechanism of his tape recorder. He turned to face Haystack Butte, and began talking with quiet expectancy into the small black disc of his microphone.

Lazily, the red column of the marker smoke rose above the runway's beginning.

Someone broke the silence :

"There he is, lower than before, just to the right of Haystack."

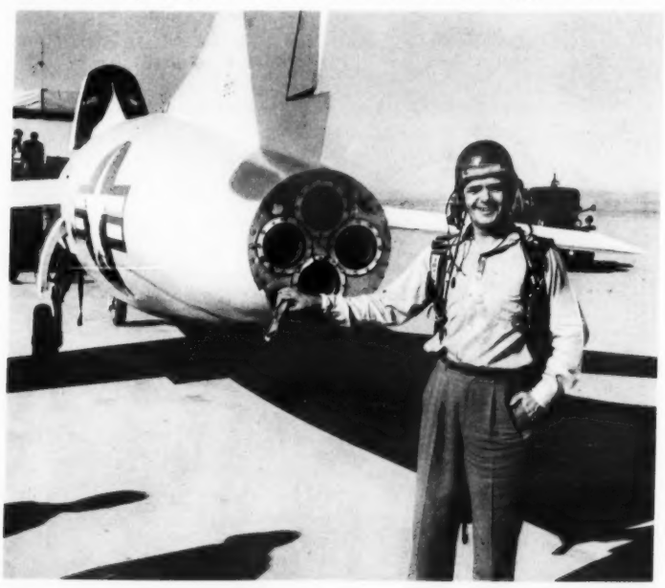
A white speck, skimming the desert horizon, was racing toward the turning point of the base leg of the speed course.

Radio brought May's sharp voice through the loud speaker.

"Fire One !"

A long-drawn pause.

Gene May laughs as he poses next to tail of "Skyrocket" after supersonic flight. The metal ring fire guard of the lower rocket has been burned through and fused.



"Fire Two !

"Fire Three !

"Fire Four."

The white speck, now sharply defined against the dark slope of the Butte, became an arrow as May banked into his approach turn, became again a white dot as he leveled off head-on toward us, became briefly an arrow again as he dove slightly for the "deck," then suddenly took on its full shape of teardrop body and knife-thin white wings.

With dazzling suddenness the "Skyrocket" was through the red cloud of the marker flare. It seemed to hang motionless, rock-steady, just a few feet above the lake's surface, but growing in size. On it came in ghostly silence, and suddenly had the fierce, flashing speed of a projectile.

Without a whisper of announcing sound it was upon us, a flitting white thing that was past us in an instant, trailing a twelve-foot streamer of bright orange rocket flame broken into a vivid chain of shock-wave "balls of fire."

Then came the crashing waterfall thunder of the four rockets pouring their brute power into the phantom shape racing away toward the waiting newsreel cameras, a roar drowning out the voice of the turbojet.

How fast ?

Someone in the upper echelons of Navy officialdom had turned thumbs down. We would have to guess.

That May had passed at a speed exceeding that of sound was agreed. There was no secret that to have done so he would have had to exceed 757 miles per hour in the 55 deg. Fahrenheit temperature of the flawless morning. Non-military experts, including officials of aircraft companies who witnessed the flight, pooled their guesses and came up with a figure of 780 miles per hour.

And by that time, his turbojet fuel nearly exhausted, May had landed, coasted up to the waiting throng of newsmen, braked the "Skyrocket" to a bobbing halt, raised the glass windowed canopy, and surrendered himself to questions-and-answers.

Some had guessed that he had hit 800 miles an hour, and would he confirm it ? May smiled and shook his head. The "silence" was on him in saying just how fast he had flown.

He climbed from the "Skyrocket," and standing on the sun-baked silt of Muroc he repeated that there had been "nothing to it."

"You just sit there in complete silence and ride her through," he said. "If my fat cat had been in there with me I could have said 'Kitty !' and he would have heard me. You know you're traveling, though. You can't hear the rockets, but you know they're still with you. You can feel their brute power pushing at your back."

On a day of desert illusions, of distances you could almost reach out and touch, of shimmering mirages, it was somewhat disillusioning to see him standing there knocking the "Sonic Wall" into mythical bits. It had been such a first-rate illusion while it lasted !

Gene May hadn't even bothered to wear a "G"-suit for his supersonic flight. He wore dark green slacks and a casual, light green Hollywood sports shirt. His parachute and his crash helmet comprised his flight garb.

He grimaced when one interviewer said :

"Gene, it's too bad you couldn't have had the judge out here today to see you fly straight down the black line faster than sound."

The day before, driving his car on a Los Angeles Boulevard, May had been hit by a car driven by a woman. Both had been arrested, the woman booked by police as a "drunk driver" and May as "drunk in auto." On the morning of his flight Los Angeles newspapers had carried news photos showing May trying to walk a police station chalkline in a sobriety test. But there could be no doubt that he was

cold sober and cockily confident when he climbed aboard the D-558-2.

"That was just one of those things, I guess," May replied to the reporter.

The 45-year old Douglas pilot, who probably is the world's only "supersonic grandfather," admitted that flying just off th eground at Mach-One- plus allowed no lapses of attention to the problem at hand. He insisted, however, that supersonic flights require no longdrawn special training of a pilot—if he has a plane designed for the speed.

May told me :

"Not long ago I was bragging up the Skyrocket to some Navy officers in Washington, and told them that I wouldn't be afraid to turn any one of them loose to fly the plane at supersonic on his first trip, after a brief session of ground instruction. Two of them took me up on it and came out to Muroc. And, just as I had promised them, they pushed through on their first flights in the plane."

Actually, the "Skyrocket" seemed to have had a rougher time of it than May during the flight I witnessed.

Momentarily freed from reporters, I took May to the tail of the plane and showed him where the metal ring "fire guard" encircling the exhaust cone of the lower of the four rocket motors had been burned through and fused.

May studied the damaged ring closely, and said :

"I guess we really were kicking up some heat back here. I've never seen that happen before."

He told me that he had given the plane "everything she had" in power during his demonstration.

For the first time in any plane, the "Skyrocket" had been equipped with a hydrogen-peroxide turbine fuel pump copied from the fuel pump used in the V2 rocket. Close to one-and-a-half tons of liquid oxygen and alcohol-water are pumped through the rockets in less than two minutes to provide the plane's 6000 punds of rocket thrust during high-speed runs.

What the "Skyrocket" will do in high altitude flights, in continuation of a progressive exploratory programme which has produced in excess of 5000 technical reports since the plane first flew in February 1948, is conjectural.

There are those within the Douglas Company who believe that the "Skyrocket" aerodynamically is a better plane than the Bell X-1, which first reached supersonic flight. However, they question that either

Looking a little tired, Gene May is assaulted by the gentlemen of the press.

Examiner

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Pilot Gene May in Auto Crash

The day before the flight, Gene May was booked by Los Angeles police on a charge of "drunk in auto." He showed no effects next morning. Perhaps he's more used to the air than the ground.

the "Skyrocket" or the X-1 can reach the 2000 miles per hour recently credited to the latter plane by Marvin Miles, aviation editor of *The Los Angeles Times*. They insist that at the altitude indicated for the presumed X-1 flight the plane would be subjected to a friction heat of 600 deg. F., a temperature exceeding design limitations of the aircraft's cabin structure and cooling system.

There can be little doubt, however, that Navy's readiness to permit a semi-public showing of the "Skyrocket's" full-power flight at ground level presages high-altitude performances which will be eye-opening when they are disclosed.

At the moment there is considerable speculation as to whether maximum speeds in aeroplane flight will be gained with swept-wing craft of the "Skyrocket" design or with straight-wing research planes such as the X-1.

Although no official supporting announcements have been made, it is assumed in Southern California aircraft circles that Douglas now has under construction a 2000 miles-per-hour-plus aircraft which will employ a straight wing. There may be a measure of confirmation of this in the fact that some Douglas pilots, who have been flying the "Skyrocket," now are undergoing indoctrination flights in the X-1, presumably to become acquainted with the performance characteristics of the straight wing in transonic turbulence.

To many who watched May's flight, his ability to pass through the transonic region at an altitude where the slightest upset of control stability would have spelled disaster was a significant demonstration of the proximity of supersonic air transport. They were more than ready to translate the evident ease of take-off and landing of the "Skyrocket," at speeds exceeding 150 miles per hour, into comparable performances by large transport aircraft.

It may not be quite that simple. By no stretch of imagination can the piloting of a plane such as the "Skyrocket" be considered a Sunday picnic.

While May was busy with interviews, I discussed the plane with another Douglas pilot, William B. Bridgeman, who had made some sixteen flights in the "Skyrocket."

He told me that control sensitivity of the plane is such that it takes no more than a one-sixteenth inch movement of the control wheel to send it into a climb or turn.

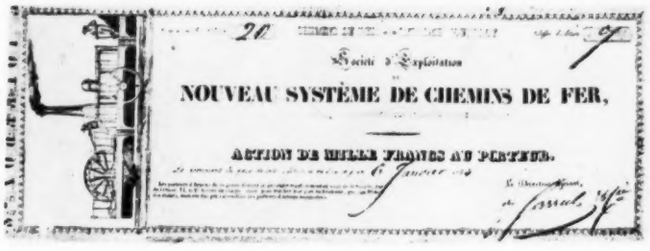
He recalled his parting advice to May, less than half an hour earlier, when he was helping him with his seat harness just before starting the demonstration.

It seemed significant.

He had said :

"I hope you don't sneeze on the take-off !"

Private or State Initiative in Air Transportation?



At first glance the question whether air transportation should be nationalized or not resembles one of those hot potatoes which an aviation magazine should leave strictly alone. Those who are more or less familiar with problems of national economy know, however, that there is a fundamental difference between the nationalization of a manufacturing or trading concern in general and that of scheduled air transportation. As part of a nation's transport system and together with a large number of other branches of economy, the regular airlines, whether privately or State-operated, belong to that category of human activity which the economist describes as "public utilities." Their name alone indicates that these branches of industry are more directly connected with the general welfare of the nation than, for example, the textile industry of the furniture industry or the flower trade.

Shortly after World War II a French writer who has never been accused of harboring socialistic ideas recommended that economists should at long last try to "decontaminate" the conception of "nationalization." They should, he stated, remove the "explosive elements" which made it impossible to discuss the question objectively in spite of its obvious importance to the welfare of the nation (*"Qu'est-ce qu'une Nationalisation?,"* by Louis Baudin, Paris, 1946). In no other field of activity Baudin's advice is more pertinent than in that of the "public utilities" and, hence, also in commercial air transportation. It would be nonsensical to describe the advocates of the nationalization of such concerns as "Communists" or opponents as "Reactionaries." In the middle of the seventeenth century Lord Chief Justice Hale exercised his exalted functions in England. He lived two hundred years before Karl Marx and could hardly be suspected of socialistic and revolutionary tendencies. All the same he declared that there existed certain types of business transaction so closely connected with the nation's vital interests that they could not be considered purely from the point of view of private law. Significantly, Hale at that time already included in these occupations such things as ferries and other means of public transport. More than a hundred years later the United States Supreme Court adopted a similar point of view in a decision promulgated in 1876 (Munn versus Illinois) by declaring that public authorities were entitled to intervene in the establishment of fares and in the general conduct of this kind of business.

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What is a Public Utility?

Neither Hale nor the Justices of the U.S. Supreme Court created the conception of the "public utilities." Throughout the history of humanity the civilized nations, whether they were governed by Conservatives, Liberals or Socialists, were forced to intervene in a supervisory, regulatory or executive capacity in those branches of economy whose functioning appeared indispensable to the welfare and existence of the nation. About 1450 B.C. the Eighteenth Dynasty of the Pharaohs concentrated its efforts on the urgently required revitalisation of the Egyptian shipping industry. The Egyptian government connected the Red Sea and the Nile by a caravan track and a canal through the lakes of Mensaleh. It pierced the isthmus of Suez (the original "inauguration of the Suez Canal") and took an active part in the shipping trade towards the Orient. In the direction of the Mediterranean the shipping industry continued to be controlled by private interests, but Government owned fleets accompanied by warships sailed to the unsafe shores of East Africa to bring back precious metals, timbers, spices and incense from the land of Pwenet. In other words, Egypt's shipping industry was operated partly by private enterprise and partly by the government three thousand years ago. In ancient Rome the postal services, the carriage of persons and goods, as well as the water supply (aqueducts) lay in the hands of the State. In the Feudal Middle Ages, with their regionally self-sufficient economies, the ancient institutions disappeared. The subsequent foundation of cities, with their large number of people, made the reintroduction of some of the public services inevitable, but it was the tempestuous increase in population, the growing requirements for efficient transport services and the technical achievements of the 19th and 20th centuries which finally produced that long list of public utilities without which life in a modern nation and a large modern city would be unthinkable.

Classified as public utilities today are the transport services (carriage of passengers and goods), long-distance communications (postal services, telephone, telegraph, etc.), the supply of energy (electric power, light, gas, heating), the sanitary installations (water supply, sewerage, garbage removal), etc.

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From organizations operating purely for profit the public utilities distinguish themselves by the fact that they must perform their duties irrespective of whether they are working at a loss or not. This disadvantage is offset by the fact that they enjoy certain privileges.

Without discrimination they must place themselves at the disposal of anybody requesting them to do so. They have to serve all users on identical terms in exchange for fees defined in published tariffs. The economically most important characteristic duty of the public utilities is to provide a capacity of service which is able to meet not only present but also forseeable peak demands, as a result of which extraordinary large amounts of money must be immobilized in capital investments which may seem unproductive at the time they are made. Applied to aeronautics, this means that airports, like railway stations, must seemingly be over-dimensioned in proportion to the average volume they handle at the time of inauguration. It is only in this manner that they will be capable of efficient operation for a period of several years. The same applies to the rolling stock of the railways, the air fleets and the airways of the airline companies.

These duties impose heavy extra charges on railways, postal services, energy producers, and the commercial airlines. Contrasting with purely commercial concerns, the public utilities are shackled, so to speak, in that they cannot engage exclusively in operations promising a reasonable return.

These important restrictions in the free choice and determination of their installations, performance and terms of service must obviously be compensated by certain rights in order to ensure the continued existence of services which are of vital interest to the nation. They must be authorized to require reasonable compensation for their services, to impose certain regulations on their users, to withhold their services in the event of infringements of these regulations without having to institute tedious and expensive legal proceedings. Chief of all they must be given certain monopolistic rights to protect them from unregulated competition on the part of potential private rival concerns operating purely for profit.

In view of these special duties and privileges it is obvious that the public utilities are more or less dependent upon the State, which alone

has the power to enforce suitable measures for their protection.

As regards the transport system in general and air transportation in particular, there are additional, military considerations which make continuous supervision by the state inevitable. Finally, air transportation depends much more than surface shipping upon the diplomatic backing of the State which must safeguard the interests of the national air transport system on the international scene by the conclusion of suitable agreements.

The question, "private or State initiative ?," therefore is irrelevant as regards the public utilities, including the commercial air services. Decisive State influence on the conduct of such operations is inevitable. If a debate of the subject is to serve a purpose, it must limit itself to the form the Government's control is to assume.

Nationalization by Conservatives

The nationalization of the majority of the European airline operators, which began between the two wars and after World War II turned into a tidal wave, cannot be regarded as a "troubling symptom" of the "socialization of the Old Continent" or even as a surprising phenomenon. Quite on the contrary, it has remained within the general scope of the development which in Europe has led to the gradual shifting of most public utilities to the control of national governments, provinces and municipalities. Who initiated nationalization of the railroad system in Germany ? Significantly it was Bismark's Prussia, in other words, an ultra-Conservative regime, which in the middle of the 'seventies following the first grave railway crisis brought the idea of state control over the railways to fruition and insisted on the creation of a German state railroad system. This, however, was not created until after World War I.

Subsequently Germany led the way also in the nationalization of air transport. In the first half of the 'twenties the two leading German airline operators, the "Junkers Luftverkehrs AG." and the "Deutsche Aero-Lloyd," had consistently engaged in cut-throat competition of such violence that both of them found themselves on the brink of financial ruin. As both companies were receiving subsidies from the state, the German government, notably Ministerial-Director Brandenburg, the real creator of Germany's air transport system, came to regard this life-and-death struggle as a "bullfight at public expense." In order to prevent further "waste of public funds" it decided to merge the two companies into a single operating concern, the Deutsche Lufthansa, on January 6th, 1926. The chosen instrument of German air transportation was born.

Would you like to know who was to "blame" for the nationalization of British commercial aviation ? It was the Conservative governments of Baldwin and Chamberlain. The British chosen instrument company, Imperial Airways, was formed as a privately owned organization in 1924 and, together with another private airline, British Airways, was turned into a national public utility corporation, British Overseas Airways Corporation, on April 1st, 1940.

As in the case of the German Lufthansa, this nationalization was designed to curb the waste of public funds. The Cadman Committee, whose report ultimately led to the nationalization, had been appointed by the government in 1938 because the British public had begun to worry about the fact that Imperial Airways was distributing substantial dividends while at the same time collecting even more substantial subsidies from the State.

It is significant that at the beginning of 1950 President Truman made a similar reproach to the "private" airline operators of the U.S.A., and that he has insisted on a separation of service payments from the subsidy element in the "air mail payments" awarded by the Civil Aeronautics Board. Let us not delude ourselves : the so-called private American airline operators depend upon the purse strings of the State no less than the nationalized, the "mixed" and the private companies of Europe.

A careful examination also reveals that they operate under strict government supervision just as much as their nationalized sister companies in Europe. The only difference is that for their public utilities the United States has found another form of "national control" which externally does not greatly resemble the European method of direct State operation. The Americans have created commissions exercising rigid supervision of the operation of private concerns engaged in public utility services (Interstate Commerce Commission, 1887 ; Federal Power Commission, 1920 ; Maritime Commission 1938 ; etc.), and they have set up authorities which are not limited to mere supervisory functions but literally exercise strict control of the way these private companies run their business. The Civil Aeronautics Board approves or disapproves passenger fares and cargo rates. It approves or rejects applications for the inauguration of new services, authorizes or forbids company mergers, pooling agreements and aircraft interchange contracts, authorizes or forbids the introduction of cheap tourist services, etc. Not to mention the CAB's proposed authority, which is still being hotly debated in the United States, to put air carriers out of business altogether if this seems in the general interests of American air transportation.

It is clear that in view of the fact that a "supervisory authority" may wield such powers, very little room is left for the development of "private initiative" and that in the end result there is very little fundamental difference between the status of American and European air carriers.

Who is Better Off ?

At the beginning of 1950 one of the leading British aviation journalists, John Longhurst, who formerly was with Imperial Airways, published a very carefully compiled, objective study of the not always successful growth of the British airline corporations (*"Nationalization in Practice,"* Temple Press, London). The chapter dealing with the economic consequences of nationalization starts with the following words :

> "The government's own admission that BOAC and BEAC have been 'overcentralized,' 'somewhat top-heavy' and 'over-manned,' and the Minister of Civil Aviation's drastic directive that the joint deficits of the Airways Corporation must be reduced to £5,500,000 for the financial year 1949-50, compared with the huge loss of £11,000,000 for the year 1947-48, are sufficient evidence of the fact that the productive efficiency of this State Industry has, up to date, left much to be desired . . ."

With a wistful look in the direction of the United States Longhurst continues :

> "Pan American Airways' results, read in conjunction with that company's productivity figures indicate the extremely high efficiency of that company . . . For those who believe that private enterprise is to be preferred to nationalization, the case of Pan American Airways certainly seems to provide strong support . . ."

Curiously enough, some prominent Americans hold diverging views.

In the "Journal of Air Law and Commerce" of Chicago's Northwestern University (Summer 1949), Professor M. George Goodrick, lecturer in business administration, calculates that since 1944 the airline industry has been kept alive largely by air mail subsidies :

Profits and Losses of the U.S. Airlines

(Losses between parentheses)

Air Mail Profit				
1944	1945	1946	1947	1948
$13,536,498	15,636,258	11,785,236	15,338,531	32,300,665
Non-Mail Net Income				
1944	1945	1946	1947	1948
$13,197,247	27,473,821	3,744,305	(35,240,711)	(37,580,722)

He demonstrates that in 1948 the subsidy element in the total air mail payments reached a proportion of 60 percent. He comes to the following depressing conclusion :

> "It seems evident that the facts of the situation offer little hope or encouragement to those who still expect that commercial air transportation can become truly self-supporting within the framework of existing legislation, administrative policies and flight

techniques. It seems probable that further expansion of the commercial air transport industry, under present circumstances, will result in *greater* rather than less subsidy benefits in the years ahead. This conclusion is based primarily on the fact that the expansion will almost surely require increased direct expenditures on the part of the Federal Airways, for the improvement of air terminal facilities, and for expanded weather services."

In a widely noticed, repeatedly reprinted article entitled "Our Airsick Airlines," David Bernstein, the American economic writer, pronounces the following devastating verdict of the U.S. air transport industry :

"Of all industries in our 'free enterprise' system, the airline is the most modern, the showiest, and—at this moment—the most spectacular commercial failure . . . If Adam Smith were to have his way, most of the 'Big Sixteen' should go out of business ; or, at least, they should drastically cut out their equipment and operations, and fly only those routes that make financial sense."

Who is happier ?

A Way Out of the Labyrinth ?

Just as the sufferer from insomnia expects to benefit by each change of position, numerous contemporaries anticipate a return to economic soundness from every change of system in the commercial air transport industry. On the one hand they insist that private enterprise companies should be nationalised, on the other hand they believe that government owned companies should be de-nationalised, and a third recommended solution is to retain the principle of nationalisation but to carry out fundamental changes in the statutes in the government controlled concerns.

Many arguments are being used to show how unsound the principle of nationalisation is. State controlled companies are accused of "top heaviness," of entertaining an "inflated bureaucracy," of encouraging monopolistic tendencies harmful to the nation's overall economy, of giving absolute priority to the technician and engineer to the detriment of sound business principles, with the inevitable result of eternal deficits.

It cannot be denied that any state operation tends to turn into a bureaucracy. In this connection an objective yardstick is often sought in comparisons of the operational performance of various airline companies. Numerous attempts have been made to calculate the ratio of administrative costs to total expenditure or to compare operational results with the number of personnel employed. For amateurs of statistics we reproduce a table from John Longhurst's book comparing the performance of a number of companies with the number of their employees.

Employee Productivity for 1948

Airline	Employees as of Dec. 31, 1948	Revenue Miles Per Employee	Revenue Ton Miles Per Employee
BOAC	19,146	1,376	2,704
BEAC	7,100	1,739	2,251
BSAAC	2,093 (1)	2,471	6,180
Air France	12,962	1,821	5,031
KLM	13,938	1,539	4,836
Sabena	2,946 (2)	2,854	6,097
Swissair (3)	1,610		
PAA	15,741	3,903	10,534
Qantas Empire Airways	3,957	1,711	4,576

(1) As of March 31, 1949 ; (2) As at October 31, 1948 ; (3) According to a Swissair communiqué of March 16, 1950.

What do such tables prove ? They show that there exist companies working profitably with relatively large staffs, as well as companies with limited payrolls working at a loss. Apart from that, comparisons like the above can be misleading, since the big intercontinental operators require smaller numbers of personnel for the few airports which they serve, whereas the medium stage continental operators must have large staffs of employees at every airport at which they land.

Similar weaknesses are a feature of most arguments for and against nationalization. It is not true that all government owned airlines are monopoly concerns. Numerous irregular and charter airlines in Britain and France provide a measure of competition to the government lines, and in the international field the competition is provided by the individual nationalized operators. None of the nationalized lines ever dare go to sleep for fear of what the competitors might do. Incidentally, the tendency towards the creation of monopolies is not a characteristic feature of government owned enterprises, proof of which is the bitter fight now being waged by President Truman against the world's most powerful commercial concern which holds major interests in General Motors, Bethlehem Steel, United States Rubber, Bankers Trust Co., etc. The company is the DuPont de Nemours Chemical Combine which produces anything from nylon hose to motor cars, oatmeal, armour plate and medicaments, in fact, anything that is good and expensive. It is this company which has recently been accused of harboring designs also of the American air transport system.

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Finally as regards the organizational set up of state controlled airline operators, the past few years have produced a kaleidoscope of differing versions in all parts of the world. Nevertheless, no clear picture concerning the most suitable type of organization has emerged. At first glance it would seem that the British Airline Corporations are given the smallest degree of liberty of all operators and in all their decisions depend directly on the ministerial apparatus to which they are responsible. A somewhat greater degree of autonomy is enjoyed by Compagnie Nationale Air France, even though its freedom does not compare with that of the defunct Deutsche Lufthansa during the years of the Weimar Republic. Other European countries have chosen alternative solutions. Their governments contented themselves with the acquisition of the entire capitalization of or a majority interest in existing private-enterprise companies. The articles of association of these operators were not fundamentally changed, and the governments merely appointed some of the directors and key executives.

It is not yet possible to judge which of these systems is the economically most efficient. The optimum solution probably is to give a maximum degree of autonomy to government controlled operating concerns and, chief of all, a maximum degree of responsibility to the executive staff of private or state controlled concerns.

So far as the financial results of the airlines is concerned, this obviously does not offer any solution.

It must be realized that today's difficulties of international air transport operations are no unusual phenomena. Prior to World War I the railroads of most countries succeeded in operating very profitably. Today they must be subsidized without exception. The privately owned railways do not fare any better. The profits reported for 1949 by the American railroads (they dropped by about 30 per cent as compared with the preceding year) no doubt are also due mostly to government subsidies.

Numerous writers have blamed uncontrolled competition between the railroads, road transport and airlines for the fact that the transportation industry as a whole seems to have lost its profit making capacity and now largely depends upon subsidies. They expect a turn for the better from a reasonable co-ordination and co-operation of all modern means of transport.

One thing is certain : the present phenomenon of unending deficits by the public utilities must not be accepted as inevitable in the long run. If the worst comes to the worst, the airlines may ultimately have to endeavor to eliminate operations on unprofitable routes, even at the risk of setting back the growth of air transportation as a factor of national economy by a few years. This would mean at most that the industry would have to make another start from the point it had reached upon the outbreak of World War II. For if the war drums, which today still induce the governments to be generous and even extravagant should be silenced one day, it is quite possible that the subsidies to the air transport system and to other branches of industry will be greatly reduced. Or as General Dwight D. Eisenhower put it recently :

"In family life, if we spend more than we make we are dispossessed. I don't see how a nation can expect different treatment."

The Air Hostess Told Us...

Love is in the Air . . .

Love, says a song of a few years ago, is everywhere. It (the song) proceeds to explain that its (love's) music fills the air, and that all nature seems to hum—pause-pause—a melody from the sky. Esmeralda, our Favourite Air Hostess, came to see us in our office a few days ago, dolled up in a spring outfit which was so new that it hadn't had time to shed all its basting threads. That, however, was not normally visible. She looked good to us, so stunning, in fact, that the marmalade fell off the slice of bread we were eating pensively at the time, bleating the above song between chews. Esmeralda confirmed that the vernal equinox has reawakened the world's chronic pain-in-the-neck, love. Stalk-eyed males, she said, are once again ogling the girls as if trying to convince themselves that some (but only some) still have shapely legs and a nice geography and that the majority would have been well advised to continue wrapping up their purely functional walking utensils and superstructure in Wellington boots and charitable fur coats.

Our Favourite Air Hostess told us that the song under review was not merely one of those gentle, caressing spring tunes but recently found a real-life application in The Case of The Frustrated Platinum Blonde. A short while a go a tempestuous, thirty seven-year old platinum blonde hired a twin-engined Beechcraft personal transport to fly from New York to Palm Beach, Florida. Spring must have broken out the moment the little party arrived over Washington, for suddenly the blonde, whose visiting card read Miss Willie Jane Frost, developed an irresistible craving for affection and staged a torrid love riot entirely out of keeping with her name. She started her aerial melee by a pass of such force at Pilot K. H. Dubanowich that the Beechcraft went into a nose-dive and came out trembling like a leaf. Co-pilot T. O. Sallee, whom the pugnacious piece of pulchritude had in turn yanked out of his seat, took it on himself to reduce Miss Frost to her indicated temperature. In a flash, the peroxide popsy flung herself into his arms, slapped his face and asked coyly, Do you love me ? Yes, yes, Sallee replied hastily, where have you been all my life ? And that's a lie, screamed Miss Frost, you don't love me one little bit. She thereupon began to beat him up according to all the rules in the Professional All-in Wrestlers' Manual. Pilot Dubanowich glanced over his shoulder ; shrank down into his seat and radioed Washington Airport that he was in distress. I'm coming down, he whispered into his microphone, love has broken out in the back . . . Meanwhile, Sallee was kept busy in the cabin. Indubitably, my honey, he was repeating, I love you madly—punch on the nose—ouch, I love you so much it hurts—slap in the face—ow, I adore you to distraction—sock on the jaw—all the way back to Washington.

You see, says Esmeralda, the song fits. Love is everywhere, even in an aeroplane. Miss Frost's amorous coos filled the air and the Beechcraft's engines hummed the specified melody from the sky.

Problem : Pressure or Vacuum Cabins ?

Ever since a flying kick restored Esmeralda's portable but inoperative radio set to perfect working order, our Favourite Air Hostess has confessed to an irresistible yen for questions of precision engineering. Her present interest in the finer points of cabin pressurization was aroused by three recent, well-publicized incidents. In the first, the door of a pressurized airliner suddenly blew open, aided by the extra air pressure in the cabin, and the steward hovering solicitously over his passengers literally vanished into thin air. In the second, the door also opened, but the steward, three-quarters out of the aircraft, was lucky enough to hold on until an emergency landing had been made. In the third, a window of an aircraft on a company flight suddenly disappeared, an air hostess dozing in her seat was blown through the opening, but a company employee sitting next to her pulled her back in by her girdle. (Surprising, says Esmeralda, that ladies' dainty "foundation" manufacturers haven't used the case for their advertising campaigns : "Treo with Fashioned Front saves you from blow-outs" —"Custom-fitted Fortunette holds you back"—"P. N. Practical Front is practical in every way"—"Biaband by Poirette with Live Elastic Fingers snatches you back from limbo"—"Flatterin' keeps you from Flutterin' "—etc.)

This incidental "tendency" of pressurized airliners could be used for practical purposes, opines our Favourite Air Hostess. Two immediate embodiments are obvious, one with parachutes, the other without. The first could be used profitably on those air services originating in certain regions of Europe, on which aircraft seem to develop a powerful "*Drang nach Westen.*" Suppose the pilot suddenly hears a voice that says, Head for such-and-such a place, or else ! and feels a hard, cold, small, round object pressing against the back of his neck as a means of gentle persuasion. All he would have to do is to pull a handle, out would fly the passengers with kit and caboodle to parachute to earth well within the national boundaries, and the pilot wouldn't even be told off for being late. In the second embodiment of the invention, the device might be used to get rid of undesirable opponents, at least in countries where defenestration still is accepted as a political expedient. Take your friends "for a ride" in a airliner fitted with a "defenestrator cabin," pull the handle, and there you are ! Your majority at the next election is bound to be 99.99 percent, the difference of .01 percent being due to natural frictional losses at the polling booths. To cut operating costs, you can attach the windows to the fuselage with bits of string, so the device will be ready again for immediate use.

For ordinary airlines, however, Esmeralda suggests that pressure cabins should be replaced with vacuum cabins. In case the door should suddenly open, the steward would be blown *back into* the compartment. The vacuum pump would have to work only at low levels—higher up money would be saved by switching it off.

The snag is that considerable technical ground installations would be required. But our Favourite Air Hostess has already thought them all out in detail. Upon arrival at the airport passengers would enter a decompression chamber to be acclimatized to their new surroundings by gradual reduction of atmospheric pressure. In that chamber they would go through the inevitable passport and customs rigmarole at the hands of officials tastefully dressed in diving suits (since they would otherwise be decompressed too often each day). The pressure would be kept somewhat higher than in the aircraft, so that all that would have to be done is to take the passengers to an air-sealed tunnel leading to the aircraft and to open the door of the latter. Passengers would immediately be sucked into the vacuum cabin at a great saving of time. Upon landing they could similarly be blown back into the decompression chamber and compressed back to normal while being processed by the customs types. There would be no unusual waste of time, since you have to wait hours for the take-off anyway.

Many agreat invention has been sparked by an unexpected mishap, says our Favourite Air Hostess. Maybe the pantie-girdle incident will open a Great New Era of Commercial Air Transportation.

Ground Helps the Air

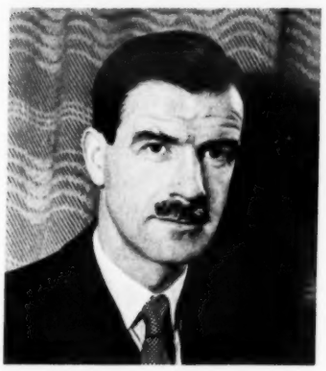
The Growth of International Aeradio Ltd.

"There's something wrong with the whole doggone set-up." So said Representative L. Mendel Rivers, Democrat from South Carolina, member of the House Armed Services Committee, in January, 1947, when American Congressmen were demanding a full-scale investigation of the air travel business because of a high rate of accidents.

At the same time in Britain, the Ministry of Civil Aviation was beginning enquiries as a preliminary to the investigation of an air crash near Folkestone which caused death or injury to many passengers after a nightmare flight over fog-ridden Europe. American press reports stated : "Nation-wide distrust of air transportation is sweeping the country." Britons glumly glanced at the fog outside as they thumbed their diaries of overseas engagements to be fulfilled by air.

News of the formation of International Aeradio Limited was announced on 13th January, 1947, by Whitney Willard Straight, at the time Deputy Chairman of British European Airways Corp. The British press, seconded by papers overseas, hailed the foundation of the new organization as a concrete contribution towards commercial flying safety.

The plan to create International Aeradio Limited—now widely known as "IAL"—was conceived by British airline and Ministry of Civil Aviation experts. The opening words of the statement on 13th January indicated the company's intentions. "The safety and regularity of airline operations are dependent upon an efficient system of ground services, including telecommunications, radio aids to navigation and a satisfactory method of blind landing . . . To meet this urgent need the three British Air Transport Corporations have formed a company to be known as International Aeradio Limited . . . The company's objective is to install and operate telecommunications and radio aids to navigation throughout the world wherever they are required and would not otherwise be available . . . In short," the report continued, "International Aeradio Limited will be a co-operative undertaking which will both assist the country providing the facilities to undertake its (I.C.A.O.) obligations and serve airline operators, whether British, Dominion or foreign, to whom efficient ground services are a necessary and indispensable prelude to efficient operation."



Air Commodore C. S. Cadell, Managing Director of International Aeradio Limited, has been closely connected with signals and telecommunications since 1926 when he joined the Royal Air Force and specialized in this branch of aviation science. During the war he was responsible for signals and radar planning in the Middle East zone of operations and was signals expert on the Normandy D-Day planning staff.

Air Vice-Marshal Sir Victor H. Tait, Operations Director of British Overseas Airways Corp., is Chairman of International Aeradio, Ltd.

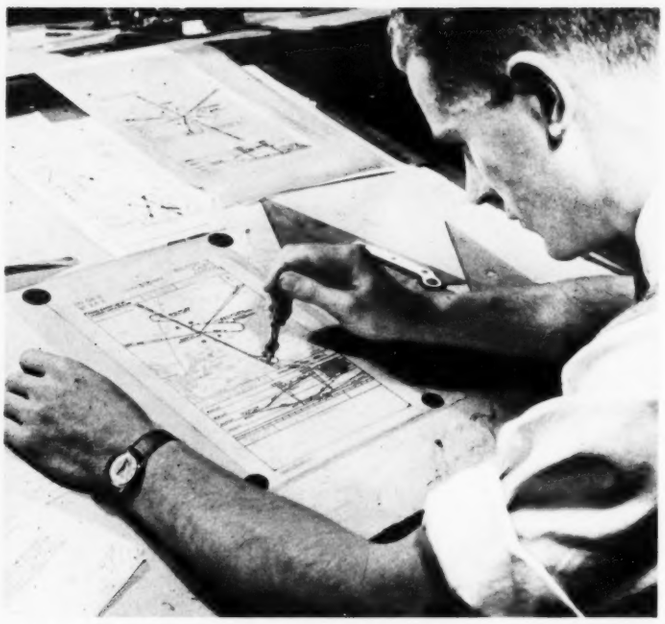
Scepticism about the IAL charter was voiced by aviation people in many parts of the world. Here, they said, is a plot to sell British radio and radar equipment. How can an improved system of ground-to-air, point-to-point services be achieved without raising airline operating costs ? Won't certain countries take advantage of the needs of operators by installing the necessary equipment and then charge exorbitant rates for their use ? Why should airlines accept IAL's invitation to become member-shareholders in the Company ? What would they get out of it ?

The man chosen to guide IAL to its destination was Air Commodore C. S. Cadell, a university entrant to the Royal Air Force and specialist in Signals and Telecommunications. His appointment as Managing Director was delayed because of protracted negotiations for his release from the R.A.F. to take up the post and was not made until April 1947. The subsequent appointment of Air Vice-Marshal Sir Victor Tait, of B.O.A.C., as Chairman of IAL brought together two pre-war and

Captain D. Mason, of BEAC, consults IAL Flight Guide. Picture shows convenience of Guide's small size in cockpit.

Radio Officer B.J.W. Shepperd, of BEAC, studies Radio Facilities list of IAL Flight Guide.

An IAL intelligence clerk at work. Information for Flight Guide is sifted and instructions passed to Drawing Office draughtsmen.

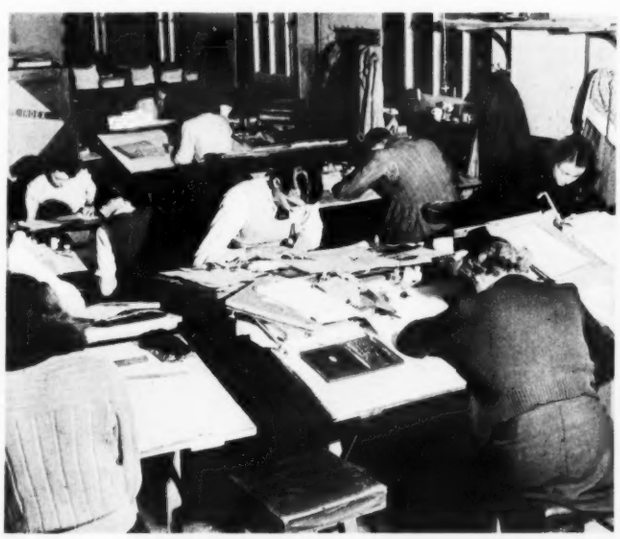


Draughtsman prepares a "Let-Down" diagram for Flight Guide (in this case for use at Farouk Airport, Cairo) from information supplied by Intelligence Section.

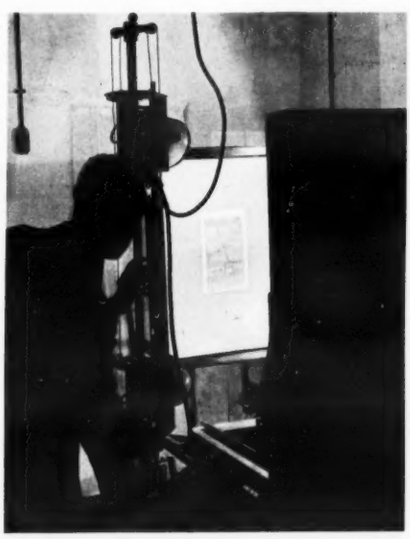
wartime colleagues with vast knowledge of the problem which IAL had set out to solve.

IAL's first overseas commitments were those previously handled by the Ministry of Civil Aviation and by BOAC on behalf of the Ministry. The end of its first year's operation showed IAL firmly established at many major points on the main trunk routes from Britain to the East. Air traffic control activities at Castel Benito, Bahrein and Bathurst were IAL-operated. At Malta IAL was responsible for the flight information centre—one of the most important in the Mediterranean. It also had signals stations at Augusta, Malta, Castel Benito, Nicosia, Bathurst, Wadi Halfa, Asmara, Kamaran Island, Malakal, Juba, Kisumu, Nairobi, Tabora, Habbaniya, Bahrein, Sharjah, Akyab, Mergui, Rangoon and Bangkok. Air traffic control, telecommunications and navigational facilities at Athens were operated and maintained on behalf of the Greek government by IAL on a joint basis with TWA. An agreement was negotiated with the Burmese government who employed IAL to supply, operate and maintain signals services at three main airports. In conjunction with the parallel American organization, Aeronautical Radio Incorporated (Arinc), and Siamese Civil Aviation authorities a plan had been drawn up to cover the operation and maintenance of air traffic control and communications at Siamese airports. Signals officers of IAL in Turkey, Syria, Iraq and Persia were acting as advisers to the local civil aviation authorities. Workshops and laboratories had been installed by IAL at Bovingdon airport, a little north of London. Intensive courses were being run to train personnel for overseas appointments. IAL had been appointed aeronautical radio consultants to the British Crown Agents for the Colonies. Airlines who had agreed to participate as member-shareholders in IAL were TWA, Air France, Sabena, KLM, SAS and Alitalia.

Part of IAL Drawing Office where facility charts and Airfield Approach and landing charts are prepared and amended.



Original drawings are transferred to negatives in camera room.



Machine operator prepares litho plate to receive camera image of flight document to be printed.

IAL also produces maps for route navigation. Information of a changing nature can easily be drawn on processed panels (above) because of special surface.

Compilation clerk makes up printed sheets into books.

Problems of operation of a company like IAL, with ramifications in many parts of the world, were becoming apparent. Changes in overseas governments and changes of policy by airline operators had an effect on contracts and requirements. Shifting currencies brought new problems to agreements. But the probing went on for new outlets of interest to civil aviation affecting the vital safety and regularity factors which the company had set out to improve.

IAL's entry into the air navigation route manual field was achieved by absorbing the BEA route manual unit and gearing its efforts for universal use. The one-colour BEANAD Flight Guide, used throughout British European Airways on the basis of extensive operational experience, was reduced to new convenient size for handling in the cockpit and extended in scope to include countries on main trunk routes. The *Aerad Flight Guide*, as it was called, is now used by nearly 200 subscribers, large and small.

The final product.

The IAL Aerad Service was extended soon afterwards by the addition of the BOAC route book organization. Integration of the BOAC and BEA units into an economic whole showed a saving for both airlines and has resulted in the best of two conceptions of route manual production being made available for the use of other operators and administrations at low cost. "Penny Plain" (Aerad Flight Guide) and "Twopence Coloured" (large-size three-colour production as used by BOAC) is how these books are now being popularly termed in the trade. Recent meetings with member-shareholders have shown the possibility of further economy by closer integration of route manual production units. The IAL Aerad Service now also acts as route navigation consultants and supplies navigational requirements of airlines and ground authorities.

Aeradio maintenance needs by airlines on long-haul trunk routes were answered by IAL

Part of printing shop with line of small offset presses used for colour prints in BOAC route book and black-white prints in Flight Guide.

Processing map panels, after adding basic information, achieves rigidity and allows changing information to be added.

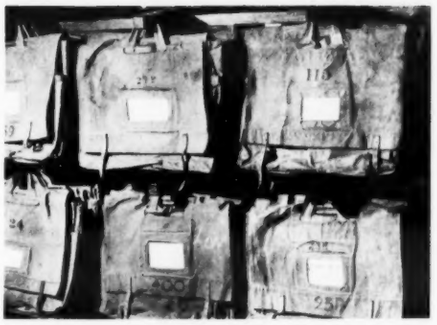
in 1948 by the establishment of technical assistance at practically all their overseas stations and by setting up aeronautical radio maintenance organizations to British Certificate of Airworthiness standards at Bovingdon, Cairo and Karachi. The end of the second year of operation showed that the turnover of the company had increased from £131,817 for 1947 to £557,499. This increase enabled the company to earn a small trading profit and to provide for the adjusted trading loss for the year 1947, amounting to £11,477. After setting aside the sum of £7,500 to meet the company's anticipated liability for taxes, a sum of £1,215 was carried forward.

The pattern of IAL activities was becoming clearer. Member-shareholders had increased by the addition of Air-India International, Australian National Airways, China National Airways Corporation (now inoperative), Qantas Empire Airways, Swissair, and the U.S. Arinc, making a total of fifteen.

Non-British airlines are represented on the IAL Board by a director nominated by member-shareholders. Periodic reports of progress are made to meetings of technical representatives of all member-shareholders, so that the interests of shareholders can be promoted in all parts of the world where IAL is represented.

Today, as IAL faces the requirements of an aviation world which shows signs of emerging from the doldrums of worrying losses but when the call for economy is still a dominant feature, it is time to pause and consider the criticisms made at its inception.

IAL has undoubtedly stimulated the sale of British air traffic control equipment by giving a better picture of future requirements to British manufacturers who seek their advice, as aeradio consultants, and by issuing specifications. It is clear, however, that the budgetary needs of IAL clients must be answered by best-for-the-purpose equipment, whatever the country of origin.



Navigation bags containing all required cockpit information are delivered to aircraft before take-off.

IAL's Engineering Department at Bovingdon works out specifications for new radio equipment, also tests replacements and spares. Picture shows IAL radio engineering testing VHF receiver.

New equipment and spares are sent from IAL stores at Bovingdon to many parts of world.

Operating costs have shown a slight increase where facilities have been considerably improved. The IAL policy of using profits to improve facilities for airlines has probably been a useful factor in keeping such charges at a reasonable level. Most operators agree with the principle that an increased safety factor is unlikely to be achieved without some additional expense. To date, despite the earlier suspicion, there is no sign that administrations are taking advantage of the operators in this respect.

Finally, the belief that a concern largely financed by British money would prove unattractive for membership by overseas airlines is refuted by the number of member-shareholders already enrolled.

Since the end of 1947, IAL has consolidated its list of commitments. IAL now has major representations at Cairo, Basra, Karachi, Sarawak, Vienna, British Guiana and Barbados. Commitments in Greece were relinquished when Greek civil aviation interests took over from the R.A.F. and U.S. Air Force.

Associated companies in Nairobi—International Aeradio (East Africa) Ltd., which is concerned at present mainly with aeradio maintenance activities—and Karachi—International Aeradio (Pakistan) Ltd., which in addition to aeradio maintenance activities has undertaken a large technical training task for the Pakistan government—are now in operation.

What of the future? Air Commodore Cadell, writing in the December 1949 issue of the "IAL News Letter," the Company's house magazine, says: "Commitments during the last three years have steadily increased. The full implications of the effort necessary to implement ICAO recommendations is being realized by more and more governments and administrations anxious to achieve the benefits of a well-ordered system . . . IAL is equipped and ready to serve aviation interests who are concerned with the safety, regularity and economy factors in air transport operation. There is clearly a need for our services. New commitments in Pakistan, the British Caribbean, Sarawak and North Borneo are pointers to the new business which is coming our way."

Mobile air traffic control unit designed by IAL. Picture was taken while cameramen were taking shots for film on modern air transport.

Glenn L. Martin's Come-Back on the Civil Transport Stage

Considerable significance is attached to the fact, announced a few weeks ago, that the Glenn L. Martin Company, of Baltimore, Md., one of America's oldest aircraft manufacturing concerns, has succeeded in obtaining contracts from two major potential clients in the American and even the international commercial transport markets. In effect, Martin has undertaken to supply thirty of its new Model 4-0-4 twin-engined medium-stage transports to Transcontinental & Western Air (TWA) and thirty-five machines of the same type to Eastern Air Lines (EAL).

The background of the two contracts is of interest. When the war came to a close, the urgent necessity of finding a replacement for the veteran Douglas DC-3 twin-engined medium and short-stage transport became apparent. Opinions of both manufacturers and operators as to what would constitute the most needed and suitable type were divided, except perhaps in one respect, namely, that its performance should be better than that of the DC-3. Some envisaged aircraft for typical feeder services, not larger than the DC-3. Others foresaw much greater traffic volumes on the medium-stage routes and specified bigger aircraft. Experiments were made by several aircraft makers. The Douglas Aircraft Company itself, proud parent of the proven DC-3, made a determined excursion into the medium and feeder transport field by developing the somewhat larger Douglas DC-8 "Mixmaster" pusher-type (airscrew aft of the tail) and by designing the Douglas "Skybus"; the latter was never built. Lockheed Aircraft Corporation showed its interest by building the twin-engined Lockheed 75 "Saturn" short-range model. The Boeing Airplane Co. followed suit with the Model 417 feeder-type. But all three manufacturers soon abandoned their plans. In Europe, the Swedish SAAB, which at the present time still stands a fair chance of success with its "Scandia," the French with their SNCA du Sud-Ouest SO 30 "Bretagne," and, chief of all, the British with a long line of aircraft ranging from small feeders to large medium-stage types, showed that they regarded this market as highly promising. But ready for early delivery appeared only two models, namely, the Consolidated Vultee Model 240 "Convair-Liner" and the Martin 2-0-2 of the Glenn L. Martin Co.

Until the spring of 1950, Consolidated Vultee seemed to be the undisputed master of the field. About 150 "Convair-Liners" were produced, and about 135 were sold to American Airlines, Pan American Airways, Western Air Lines, KLM, Sabena, Swissair, Trans-Australia Airlines, and a number of smaller carriers. The "Convair-Liner" programme resulted in a loss of about $50,000,000, but Consolidated Vultee remained optimistic since the medium-range transport market was by no means saturated.

Less well fared the Glenn L. Martin Co. with its parallel project. Externally the Martin 2-0-2 somewhat resembles the Convair 240, but the basic type was not pressurized. For this reason the company simultaneously offered a further development, the Martin 3-0-3, which was to have a pressure cabin. And the manufacturers went even beyond that point by announcing an advanced version of the pressurized type, to be powered with propeller turbines and designated 3-0-4 (an evolution which, incidently, is now being actively pushed by Convair). The project seemed to be progressing smoothly, and Martin soon announced that it had received contracts for well over three hundred Model 2-0-2 and 3-0-3 aircraft. Suddenly, however, the company ran into serious trouble. Early in 1947 the necessity of making substantial structural changes to aircraft already on the production line became apparent. Numerous carriers cancelled their contracts either for this reason, or because delivery delays were excessive, or because they had been too optimistic in their early estimates of postwar traffic potentialities. By the middle of 1948 Martin's backlog for transport aircraft had shrunk to twenty-five aircraft for Northwest Airlines, out of an original order for forty, plus a small number for air carriers in Venezuela and Chile. At that time Martin also announced that it was abandoning development of the pressurized 3-0-3 and of the gas-turbine powered 3-0-4. The final outcome of the disaster was that the company lost substantially more than $40,000,000 on the project.

Silence descended on the Martin 2-0-2 and the 3-0-3. It was rumoured that the type was not fully satisfactory. The basic 2-0-2's lack of pressurization, which since had come to be recognized an indispensable feature in modern air transportation, was a drawback. Worse was the fact that, after one of Northwest's 2-0-2s had crashed in a storm in August, 1948, the wing structure was found to have certain weaknesses.

The fiasco of Martin's twin-engined commercial transport project and probably certain errors in the conduct of the whole business finally produced their effects. In the latter part of 1949 fundamental changes in the management of the Glenn L. Martin Co. took place. The concern's finances had been strained for some time, and its President and Founder, Glenn L. Martin, had long been criticized in various quarters, notably by the military.

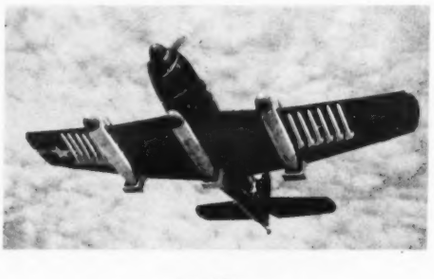
From the reorganization Glenn L. Martin emerged as the Chairman of the Board, while a new man, C. C. Pearson, assumed the actual management of the company in his dual capacity as President and General Manager. The Chief Engineer now is W. B. Bergen, Air Force Sales Manager is R. L. Sansbury, Navy Sales Manager is William J. Miller, and Commercial Sales Manager is G. B. Shaw.

The Glenn L. Martin Co. on March 15th issued its report for 1949. Very clearly, the company is on the road back to financial soundness, for it reports earnings of $5,131,500 for the year, or $4.52 for each of its 1,134,229 shares of stock outstanding; this compares with losses of nearly $17,000,000 for 1948 and over $19,000,000 for 1947. At the same time, the company's indebtedness to the Reconstruction Finance Corporation was reduced from $16,400,000 at the beginning of the year to $3,000,000 at the end of 1949. The increased earnings were possible on a sales volume of only $52,054,958, against $72,686,527 in 1948, a phenomenon which is explained by the fact that no further inventory write-offs on unsold 2-0-2s and parts were required and that close controls over operational costs and expenses have been introduced. At the end of 1949 the company still had unfilled orders of $71,655,000, compared with a backlog of $88,097,000 at the beginning of the year. The report states that continued further improvement of earnings was dependent chiefly upon an even larger volume of sales contracts, because the bulk of the present undelivered orders was scheduled for completion in 1950. It ends upon an optimistic note by stating that an increased volume of sales should be possible, indicating that the company's present labour force of 7,000 will be fully employed throughout the year.

Less favourable reports circulate in Washington, however. They allege that the Navy has decided to abandon the AM-1 "Mauler" carrier attack aircraft; that the Air Force has rejected the Martin XB-48 six-jet medium bomber prototype and is not very happy about the XB-51 three-jet light attack bomber proto-

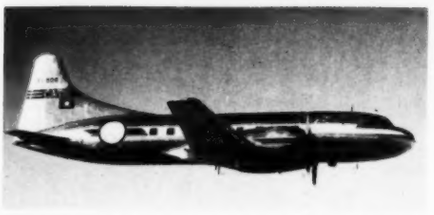
The Glenn L. Martin Company lost a lot of money on its Model 2-0-2.

Washington reports claim the Navy has abandoned the Martin AM-1 "Mauler" carrier-based torpedo bomber. Many were built. Eighty-two were turned over to the Naval Air Reserve last January.



No production contracts have been placed for the Martin XB-48 six-jet medium-heavy bomber.

The Martin XB-51 is the Air Force's first three-jet, post-war light bomber specifically designed for ground support. Rumour has it that a production contract is doubtful.



The Consolidated Vultee Model 240 "Convair-Liner," on which the manufacturers lost about $ 50,000,000, gets a serious competitor in the...

... Martin 4-0-4 airliner, contracts for which have just been placed by Eastern Air Lines and Transcontinental & Western Air, Inc. Any more takers ?

type. No production contract for the six-jet bomber will be placed, and contracts for the XB-51 are uncertain. Chief of all, one Washington source doubts that the two orders for a total of 65 Martin 4-0-4 twin-engined commercial transports, mentioned initially, are an immediately profitable business transaction. It is underlined that the 4-0-4 is practically a new design with extended fuselage, modified wing structure, new pressure cabin, etc. Against stiff competition from Consolidated Vultee, Martin has accepted these contracts in return for a surprisingly low sales price : about $35,000,000 for 65 aircraft plus ample spare parts, CAA type certification and accelerated service tests, and so forth. This is much less than $500,000 per aircraft without spares.

If the Martin 4-0-4 reveals itself as equal or superior to the "Convair-Liner," it will be a better buy than the latter and become an extremely serious competitor. This will have a pronounced effect on the plans of numerous air carriers all over the world who will be forced to buy new equipment within a relatively close future. It is an open secret that before awarding their contracts to Glenn L. Martin, President Eddie Rickenbacker of Eastern Air Lines, and Howard Hughes, majority stockholder of TWA, had long negotiated with Convair. Their decision must be of grave concern to Consolidated Vultee.

The Glenn L. Martin Co., on the other hand, now has a unique chance—even should it lose money on the two orders—to recoup its professional reputation as a first-class aircraft designing and manufacturing firm. This chance may be worth a sacrifice. The two contracts also show very clearly that Martin is again concentrating its attention on the aircraft market. Added confirmation of this is seen in the fact that late last year the company sold its Chemicals Division to the United States Rubber Company, thus completing its programme of divesting itself of all interests not directly concerned with the manufacture of aeroplanes, special weapons and closely related products. The Glenn L. Martin Co. is definitely staying in the aircraft business and is making not only a determined bid for a major portion of current military business but also an attempt to stage a resounding come-back in the commercial aircraft manufacturing field.

From "Interavia Air Letter"—The World's Aviation Newsfronts from Day to Day. Published daily in English and French.

The Enthusiastic Let-down

I write this for the benefit of the airline executive who is trying to trace a sudden and unaccountable decline in traffic. He thinks he has done everything possible to attract more passengers. Fares have been reduced to a new low ; concessions have been made so that a passenger can now take along his wife, his ex-wife's children and his mother-in-law's second cousin—all for the price of his own single fare ; free gifts, enough to stock a PX store, have been distributed, and the executive's own salary has been so cut that it looks as if the family car will have to go.

Before further sacrifices are made and more drastic steps taken, I beg him to pause and look over the members of his staff. Screen them, locate and immediately dismiss any "aviation enthusiasts" he may find. These are his heels of Achilles.

An aviation enthusiast who has any contact with potential passengers—and anyone who can put his hand in his pocket to extract a fare is one—is like the cat among the pigeons, with the slight difference that, unlike the pigeons, the prospective passenger will thereafter refuse to leave the ground.

The enthusiast is generally a young man who knows quite a lot about aviation. He can name at least twenty-five variations of the P-40 fighter and quote the span of a P-51 to within five-sixteenths of an inch. The aeroplane has not been built of which he does not know the plan before it has left the drawing board. His enthusiasm is unbounded and extremely vocal, and when one or more people are gathered together in his presence he talks to them about his job.

Not everyone is interested in the finer points of aeroplane construction, nor even in the theory of flight, so quite a lot of the monologue goes in one ear and out the other, and no harm is done. But when the talk turns to "Flights I Have Made" the aural exits close and the audience revives. It, too, would like to fly somewhere or, perhaps having made one memorable excursion in the upper air, would like to compare experiences with another old hand. The lecture is absorbed and desolation begins to set in.

Now, the things which invariably happen to an enthusiast when he flies in a civil transport shouldn't happen to a dog. In fact he *is* dogged—by horrible nose-dives, terrific bumps, incompetent pilots, unattractive and inefficient air hostesses, bad weather and delays.

Once, an enthusiast I know was on a flight over low-lying country and was forced down as low as 5,000 ft. by bad visibility. He has encountered the largest "air pocket" ever experienced, in consequence of which the contents of the galley rattled like a truckload of empty cans. Another time he made such a harrowing landing in a DC-4 that he was convinced that all large transports should be fitted with crosswind landing gear immediately. On the subject of such landings I have heard him complain bitterly of the inhumanity of air hostesses who, instead of making a comforting tour of the passengers, remain safely belted up in their seats. He meets up with the darkest nights, the thickest clouds and the foggiest fogs.

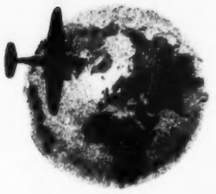
Even after he has landed his misfortunes do not cease—the traffic staff lose him on the way to the airport buildings, he is suspected of carrying contagious diseases on his person, some facetious fool removes his ticket from his pocket and places it in the lining of his hat or some other unexpected part of his clothing. There are even people who are so mean as to louse up his trips by withholding the information that airlines publish timetables, the result being that he has been known to sit around for twelve hours waiting for his journey to begin. This, in turn, convinces him that the people running airlines don't know their job. This conviction he is only too glad to share with anyone who will listen.

Something nice did happen to him once. He was lucky enough to sit beside a charming old lady who didn't know a great deal about aviation, so he was able to make the time pass for them both by discoursing on his subject. I *know* that the old lady was interested : *he* told me so. By the time they reached their destination she was so numb with the terrors of aviation that she had to be prised out of her chair with a crow bar, and there was nothing in her mind but that the young man's heart was in his work.

I could imagine a fitting sequel to this episode. At ten o'clock next morning the aviation enthusiast is called by his boss, an executive of the airline for whom he works. "Yesterday," says the boss, "you were kind enough to entertain my mother on her flight from X in the most charming and engaging manner. I thank you for your courtesy and suggest that we should sever our relations as per the end of this month . . ."

Danger lies in the enthusiast—not in the air. I can only hope that my foregoing remarks will strike them all dumb with horror, after which airliners will fly their uneventful courses with cabins full of contented, somnolent and slightly bored passengers.

Cassiopeia.



What's in the Air*

MILITARY POLITICS

A few weeks ago certain over-zealous but unauthorized circles vainly endeavoured to bring about a telephone conversation between the White House and the Kremlin. This did not upset responsible Americans, however, who continued to take more rational measures for the protection of the peace. They are rearming. And they are setting about their task with characteristic thoroughness.

In the middle of February the U.S. Defence Department published details of a programme for the stockpiling of strategic materials. In 1947 and 1948 $100,000,000 was spent for this purpose. For the 1950/1951 fiscal year Congress has appropriated $275,000,000 for the same purpose. The aviation industry's share in the programme takes the form of light metals (aluminium and bauxite), special alloys and natural rubber. It also comprises special oils, varnishes, industrial diamonds and other materials.

The nation's degree of industrial readiness has been one of the principal problems of the past few month. The U.S.A.F. and the Navy Bureau of Aeronautics have drafted a joint mobilization plan for the aircraft industry in order to determine production priorities for the most effective and most urgently needed equipment. Among other things this programme establishes the production capacity and the personnel and machine-tool requirements for each individual aircraft plant. The Chief or Staff of the U.S.A.F., General Hoyt S. Vandenberg, expressed the belief that this "package plan," when completed, should disclose the limitation of the overall aircraft programme and indicate where industrial planning can best be concentrated.

One of the reasons behind the acceleration of these plans was the recent wave of public criticism of America's military preparedness. General Eisenhower declared that U.S. military strength had dropped beneath the danger point. J. H. Kindelberger, Chairman of North American Aviation Inc., on February 16th declared before the Institute of the Aeronautical Sciences, whose President he is, that the U.S. aircraft industry was entirely unprepared for an emergency. He demanded the stockpiling of aircraft parts and

The *Fokker S. 13* five-to six-seater trainer made its first flight on March 11th.

equipment of a total structural weight of at least 50,000,000 lbs., enough to carry airframe plants through the first eight to ten months of war production while suppliers were reaching war emergency production levels ; complete renovation of 40,000 production machines (lathes, mills, etc.) now in industrial reserve storage ; training of machine operating specialists for the high-precision manufacture of modern aircraft ; revision of contract legislation and simplification of wartime contract negotiations. Novel is his suggestion that aircraft spares should be flown to combat areas by building spare parts into complete aircraft and flying the latter to where they were needed, there to be cannibalized for their components. The waste in unused parts would cost far less than building ships to get them there too late.

Owing to the European currency devaluations, *Swissair*, the national airline of Switzerland, found itself faced with certain difficulties which it is now in the process of overcoming. A head has been appointed in the person of *Dr. Walter Berchtold*, forty-four-year-old transportation expert.

Professor Vittorio Valletta, Chairman of the Fiat concern, recently spent some time in the U.S.A. for the purpose of strengthening his concern's ties with American industry.

The U.S. Defence Secretary, Louis A. Johnson, also came in for his share of criticism. Certain sources are holding him responsible for the alleged "sapping of the strength of U.S.A.F. fighter groups due to the low rate of aircraft replacement resulting from the Secretary's economies." Johnson replied to his critics in New York on March 3rd by stating that even by spending the whole of its $13,000,000,000 Defence Budget on the Air Force, the U.S.A. could not prevent the dropping of bombs on American cities. Nothing could offer a guarantee against suicide pilots, not even a Defence Budget of $50,000,000,000.

From the other side of the Iron Curtain the Soviets on February 26th announced the formation of an autonomous Navy Ministry, and in March the magazine "Red Fleet" informed its readers that the Soviet Fleet will have its own autonomous naval air service.

Rearmament all along the line. Marshal of the Royal Air Force Lord Tedder, who on January 1st, 1950, resigned as R.A.F. Chief of Air Staff, has been appointed Chairman of the British Joint Services Mission in Washington. The Defence Committee of the Atlantic Pact Nations held its third session in The Hague, which was preceded by meetings of the North Atlantic Military Production Supply Board and of the Military Committee. Pakistan announced that it was creating a bomber force. Turkey is spending 35.42 percent of her national budget for defence purposes. And the U.S.A.F. has asked Congress for funds to build three radio interceptor stations in the Far North to "learn the air order of battle, information on unit location, the status of training, type of equipment and similar military secrets of a potential enemy."

The major military event of the past few weeks was constituted by the winter exercises conducted jointly by the U.S.A. and the Royal Canadian Air Force. Called "Operation Sweetbriar," it produced the comforting discovery that jet-propelled aircraft are now much more efficient in Arctic operations than they used to be. All 25 Lockheed F-80 "Shooting Star" jets were still fully operational on the fourth day of the exercises and 90 percent of them on the fifth. The 12 de Havilland "Vampires" of the R.C.A.F. also stood the pace until the fifth day.

AIR TRANSPORTATION

From many countries symptoms of increased readiness to cooperate in international air transportation are reported. In *Italy* the merger of Alitalia with LATI is making progress, so that only three Italian airline companies will remain in future. (To a question in Parliament whether Italy's Sterling balance should not be used to buy out the British share in Alitalia, Senator Malintoppi, who is in charge of civil aviation questions, replied that while it was not intended to issue new stock to foreign interests there was no reason for the elimination of existing interests of this kind.)

In *France* the three State airline companies (Air France, Tunisair, Air Atlas) and two companies partly owned by Air France (Union Aéro-Maritime de Transport, Air Transport), as well as three privately owned carriers (Compagnie Aéro-Maritime, Transports Aériens Intercontinentaux, Air Maroc) have formed a working group called "*ATAF*" (Accord de Coopération entre Transporteurs Aériens de l'Union Française). The Deputy President of Air France, René Briend, was appointed Chairman of the Central Committee composed of members of the cooperating companies. Four specialized sub-committees will coordinate the interests of the operators forming the Group. The first practical measure was the creation of three travel categories, divided according to flying

At the age of fifty-five *General Muir S. Fairchild*, Vice Chief of Staff of the U.S. Air Force, died on March 18th as a result of a heart attack.

equipment with fares, which came into force on April 1st. (For example : Paris—Algiers costs frs. 19,850 first class, frs. 14,770 second class and frs. 12,100 third class. Third-class aircraft are not sound-proofed !)

In the *U.S.A.* the Civil Aeronautics Board closed the hearings on the application of Pan American Airways to acquire the assets of American Overseas Airlines. The forthcoming decision on the case will have far-reaching consequences on the American and international North Atlantic air services.

Meanwhile, the U.S. airlines continue to worry about one of their most immediate problems, namely, taxation. The Executive Vice-President of the Air Transport Association of America told the House of Representatives' Interstate and Foreign Commerce Committee that the recent reduction of the Federal Transportation Tax on passengers from 15 percent to 10 percent would give the airlines very little benefit, whereas full repeal of the tax would increase passenger revenues by some $20,000,000 a year.

Seemingly in reply to this statement, the Civil Aeronautics Administration a few days later announced a fuel tax amounting to 1.5 cents per gallon, the revenue from which is to contribute to the cost of air safety equipment.

* Based on reports published in "Interavia Air Letter," daily international aviation news digest appearing in English and French.

AIRCRAFT DEVELOPMENT

A review of notable events in aircraft engineering in the past few weeks indicates as the most outstanding fact a decision by the U.S. Air Force, announced at the beginning of March, which may open a new epoch of military aviation and is partly based on technical considerations. Under this decision, *the Convair B-36 giant bomber, today's chosen instrument of America's global air strategy, will not receive a successor in the long-term programme of the U.S. Air Force. Quantity production of the Boeing B-52 jet-propelled strategic bomber, which was scheduled to start some time in 1955, has been abandoned.* An obvious deduction from this announcement would be that long-range rocket-powered guided missiles would be operational within the next five years, as a result of which giant bombers would no longer be an urgent necessity. However, the views of informed Washington observers do not confirm this : long-range guided rockets with a range of several thousand miles continue to be very much in the future, and their development and construction still encounter almost insuperable difficulties.

Similar difficulties caused the abandonment of the B-52 jet-propelled giant bomber. Specifications called for a jet-propelled bomber with a total range of ten thousand miles. A preliminary design provided for eight General Electric J-53 gas turbine engines of 10,000 lbs. thrust each and resulted in a gross weight of 200 tons ; a second design, with six engines, seemed to be more practicable, but its flying performance would not have been promising. A return to an eight-engined solution featuring Westinghouse J-40 engines produced a gross weight of 190 tons. Lift increasing flaps, boundary layer suction, angle of incidence adjustable in flight and other devices would not have enabled such a heavy aircraft, in view of the inefficient take-off characteristics of gas turbine engines, to start from runways of reasonable length. Nevertheless the U.S.A.F. did not altogether drop its development plan. The two XB-52 prototypes will be completed and subjected to flight tests.

No long-range rockets, no long-range jet bombers. What will take their place ? First of all, *the evolution of the Convair B-36 is to continue.* The aircraft is to be given swept wings, propeller turbines delivering about 5,000 h.p. and novel airscrews (for supersonic blade tip speeds). These improvements are hoped to increase the maximum speeds to 550 m.p.h. and the ceiling to 50,000 feet without affecting range and take-off characteristics. — As a second instrument of its global strategy the U.S.A.F. is developing *guided air torpedoes of about 5,000 mile range.* This torpedo is a pilotless aircraft powered with an Allison J-33 jet capable of carrying a fuel reserve of between 7,000 and 8,000 U.S. gallons (20 to 25 tons !) and a "modest" warhead which, it is true, may consist of an atom bomb. These devices are said to be capable of attaining a cruising speed of 600 m.p.h. and would therefore reach their target only about nine or ten hours after being "fired." Their development is being shared by Northrop Aircraft and by Glenn L. Martin Co. It is reported that secret tests already are under way in New Mexico.

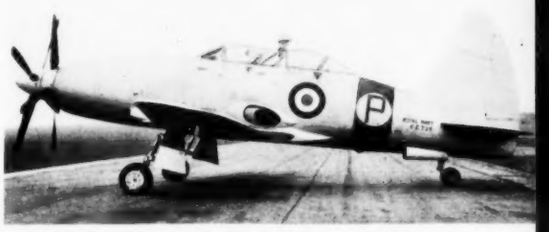
Compared with such announcements the usual milestones of technical development, the *initial flights of new aircraft types,* must take a back seat. Only two have been disclosed in the past few weeks : on March 11th the *Fokker S.13,* a twin-engined five- to six-seater all-metal crew trainer, started its flying trials ; four days later a *Vickers "Viscount"* experimentally fitted with two *Rolls-Royce "Tay"* jets of 6,250 lbs. thrust each took to the air for the first time.

The latter event induced the Chief Engineer of Vickers Armstrong Ltd., George Edwards, to make a noteworthy declaration : it was not his company's intention to develop a jet-propelled medium-stage commercial airliner. Even though the days of the reciprocating engine may be counted, the advantages of jet propulsion — improved utilization of equipment and personnel owing to greater flying speeds — could be applied only for aircraft of 50 tons gross weight or more flying over stages of 1,250 miles or more. For shorter stages airscrews, also those combined with gas turbines, would furnish greater economy.

Westland Aircraft is now building the *"Wyvern"* propeller-turbine powered strike fighter for the Royal Navy in a *two-seater trainer version designated T. 3,* in which the rear occupant is given forward vision through a periscope in the good old naval tradition.

New aircraft which are to make their first flights in the relatively near future are plentiful. They include the American Convair *XP5Y-1* propeller-turbine giant flying-boat ; the French *SE 2410* jet aircraft, one of the most widely noted exhibits at last year's Paris aircraft show, and the *SO 4000,* developed from the SO M 2 ; the first of these aircraft will have its two Hispano-Rolls-Royce "Nene" engines on top of each other in the fuselage, the second on the fuselage sides. Other aircraft scheduled to fly in the near future are the British *General Aircraft GAL-60 "Universal"* giant freighter, the American *Fairchild XC-120* cargo transport with removable cargo pods, the "super-secret" *Douglas A2D attack aircraft* with two coupled Allison T-40 propeller turbines.

The date of the first flight of the two *Bristol 175* four-engined commercial airliner prototypes, work on which was started last year, still is a mystery. BOAC, which has ordered 25 aircraft of the type, wishes to place them in commercial service as soon as possible. According to existing schedules this should be the case some time in 1954. The Bristol Aeroplane Co. therefore has announced that in order to save expense and time it will not equip the first prototype with Bristol "Centaurus" piston engines. On the other hand, the development of the final version featuring four Bristol "Proteus" propeller turbines is to be accelerated. With 62 passenger seats for long stages and 96 seats for high density-traffic and with a gross weight of 60 tons the Bristol 175 will complement the jet-propelled airliners of smaller capacity which may enter into service before it is ready for operation.



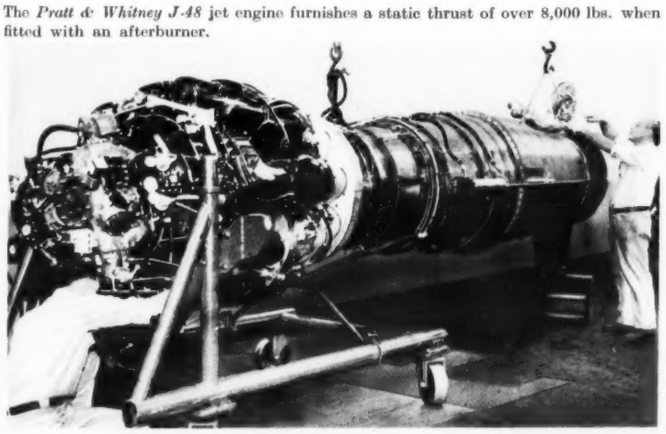
The *Westland "Wyvern"* propeller-turbine aircraft as a two-seater.

Other aircraft on which the British commercial airlines are basing some of their hopes are gradually approaching operational maturity. The first *Handley Page "Hermes IV"* airliners have at long last been delivered to BOAC ; the main assemblies of three series-produced *Airspeed "Ambassadors"* are ready for final assembly ; the first *Vickers "Viscount 700"* is to fly in July ; the prototypes of the "Viscount" and of the de Havilland "Comet" are showing their paces on the European Continent and are expected to go to Khartoum, in the Sudan, in May for tropical tests.

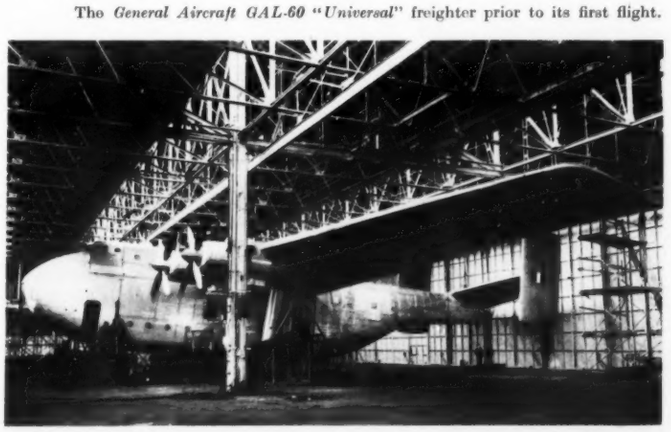
POWER PLANT

In spite of all the advantages of the gas turbine for jet and propeller operations and the driving of accessories, each new design requires protracted tests until it meets the usual specifications as regards performance, reliability in extended operations and adaptability to operational needs. To such tests a new jet engine, the *J-53* of the *General Electric Co.,* is now being subjected. With a maximum static thrust of nearly 10,000 lbs. the engine no doubt represents a step in the direction of more powerful engines. In the meantime, the *Pratt & Whitney J-48 "Turbo Wasp,"* an American engine built to the designs of the British Rolls-Royce "Tay," has become operational. It supplies a static thrust 6,250 lbs., but with two different afterburners of 5.5 ft. and 10 ft. length it supplies short-period outputs of up to 8,800 lbs.—New studies have revealed valuable information concerning the *between-overhaul periods of modern American gas turbine engines.* Whether the engines operate throughout the entire duration of the flight or are used only for temporary increases in performance is obviously of considerable importance. The General Electric J-47 turbines, used as auxiliary power plants of the Convair B-36 giant bomber must be overhauled after a running time of only 40 hours ; in their role as main power plants of the Boeing B-47 "Stratojet" bombers they require overhauling only after 100 hours. Design improvements are expected to increase these figures to 55 and 150 hours, respectively. All the same these running times still seem very modest in comparison to well-proven piston engines, many of which must be overhauled only once in 1,000 hours' running time.

The *Pratt & Whitney J-48* jet engine furnishes a static thrust of over 8,000 lbs. when fitted with an afterburner.



The *General Aircraft GAL-60 "Universal"* freighter prior to its first flight.



Book Reviews

Airliners, by John Stroud. Puffin Picture Book No. 86. — Published by Penguin Books, West Drayton, Middlesex, England.

Even the managing director or the chief engineer will readily devote an occasional minute of his valuable time to reply to the incessant and mostly quite intelligent questions of their youngest sons concerning some aircraft or another. Familiarizing the youngest generation with current commercial transport types and their classical predecessors by means of drawings, some of them colored, is greatly facilitated by this 32-page "Puffin Picture Book." Text and pictures are the product of an English aviation writer, whose predilection for detail will avert many a question that might prove embarassing to a grown-up. Airliners of the future are rightly dealt with only with considerable brevity. The young reader will have outgrown the age of picture books by the time he encounters them in actual airline service. A small present which will give more pleasure than it will cost the giver in terms of money. (English.) *T.*

Elements of Aerodynamics of Supersonic Flow, by Dott. Ing. Antonio Ferri. — Published by The Macmillan Co., New York, 1949.

The author, well known since the days of the Fifth Volta Congress (Rome, 1935) as the leading supersonic aerodynamicist of the Italian Guidonia Research Institute, has been active in the U.S.A. since 1945 and at present heads the gas dynamics division of the Langley Field research institute of NACA. In his earlier publications on measurements on supersonic airfoils and Busemann biplanes *(Atti di Guidonia* Nos. 17, 37, 38) he already showed a marked tendency to coordinate practical research work and theoretical analysis. In his textbook on supersonic aerodynamics, which comprises 434 pages and 248 illustrations, he has been outstandingly successful in applying this principle, which is a point of great practical and didactical value. The book is the first systematic as well as detailed presentation of all problems connected with supersonic flow. The theoretical investigations are presented as simply and clearly as possible, they are solidly founded and compared with actual test results. Scientists will find an extremely useful working instrument not only in the numerous diagrams but also in an extensive and precise appendix of tables. The practical aeronautical engineer will appreciate the precise subdivision of the work (index), the emphasis on the essentials of the matter by placing them at the beginning of each chapter, and the profuse illustration. Finally there is also a diagram (page 251) which permits the determination of the shock wave angle of conical supersonic bodies according to the angle of their point and their Mach number, or inversely the determination of the Mach number and thus the flow velocity of a wind tunnel test from shadow or stria (Schlieren) photographs. (English.) *Ri.*

Airplane Performance, Stability, and Control, by Courtland D. Perkins and Robert E. Hage. — Published by John Wiley & Sons, Inc., New York, N.Y., 1949.

The two authors, Courtland D. Perkins, Professor of Aircraft Engineering at Princeton University, and Robert E. Hage, Project Engineer for Boeing Airplane Co., have admirably succeeded in compressing the complex theory of applied aerodynamics in a book of 493 pages. The work, which presupposes familiarity with elementary aerodynamic theory, was written primarily for the practical aircraft engineer ; but owing to the clarity of the language it will provide beneficial reading also to the advanced aircraft engineering student.

The first part of the book describes the classical method of calculating flying performance, as applied to subsonic, transonic and supersonic velocities. Within the limits of security restrictions, consideration is given to the most modern points of view (moderately and extremely swept wings, effects of different means of propulsion, such as gas turbines, ram jets and rockets, different types of slotted wing).

The second part discusses problems of static and dynamic stability as well as aircraft control. In this discussion the authors purposely refrain from dealing with flight at supersonic speeds.

The appendix contains a summary describing structure and properties of the atmosphere as well as a compilation of the characteristics of the most conventional NACA airfoils. (English.) *Ba.*

Aircraft Engines of the World 1949, by Paul H. Wilkinson. — Published by Paul H. Wilkinson, 225 Varick Street, New York, N. Y.

Those who wish to inform themselves rapidly on the design and performance of any aircraft engine will do well to consult Wilkinson's yearbook. In the first part of the book the author describes all major gas turbine and reciprocating aircraft engines in use today ; this description takes the welcome form of a collection of type sheets, each of which contains a photograph of the engine described, dimensions, weights and performance figures (in English and metric terms) ; in addition, major design features are described in concise language. Particularly useful are tables compiling the characteristics of the engines described, as well as a survey of the fuel and lubricating oil types at present employed for reciprocating and gas turbine engines. (English.) *Ba.*

Jane's All the World's Aircraft, 1949-50, compiled and edited by Leonard Bridgman. — Published by Sampson Low, Marston & Co. Ltd., London.

The 1949-50 Edition marks the fortieth anniversary of the publication of the first "Jane's All the World's Aircraft." In terms of aeronautics this is a very long time, and the publishers do not exaggerate when they claim that Jane's yearbook holds a unique place in the world's aviation literature.

The latest Edition of the yearbook differs only very little from its predecesors. The usual division of contents into four sections, Military Aviation, Civil Aviation, Aeroplanes and Aero-engines has been retained. The information published roughly reflects the stage reached at the end of 1949. This means, for example, that relatively detailed descriptions of such British aircraft types as the Avro 707, Vickers-Supermarine 510, de Havilland "Comet" and of the two "Vampire" developments, D.H. 112 "Venom" and D.H. 113, are already available in the book. (English.) *Ba.*

Die Strategie einer Diktatur (Translation of "The Other Side of the Hill"), by B. H. Liddell Hart, translated by Lieutenant-General (ret.) Kurt Dittmar. — Published by Amstutz, Herdeg & Co., Zurich.

In 1948 a book written by the most influential British military writer, B. H. Liddell Hart, was published in England. The author, who travelled extensively in Germany before and directly after the war, was well qualified to interview captured German military leaders and paint a picture of the rise and fall of German military might as seen from "the other side of the hill." The publishing firm of Amstutz, Herdeg & Co. in Zurich have now published a very careful German translation under the title, "Die Strategie einer Diktatur" ("Strategy of a Dictatorship"). The book is of considerable interest to the military aviation expert, as is shown by the chapter dealing with the airbone forces during the Ardennes offensive, forces which are described by the phrase, "the card that was missing in the game." (German.) *He.*

Books received

(Reviews of a selection to appear later)

Raketen von Stern zu Stern, by Heinz Gartmann. — Published by Lot-Verlag, Worms.

Hirth : Erfinder, Rennfahrer, Flieger, by L. Heiss. — Published by Reinhold A. Müller, Stuttgart.

Kosten und Preise im Luftverkehr, by Harald zur Nieden. — Published by Rascher-Verlag, Zurich.

Théorie et Pratique de l'Hélicoptère, by Pierre Lefort. — Published by Editions Chiron, Paris.

Bréviaire des Erreurs de Radiosondage : la Radiosonde Suisse, by Jean Lugeon et al. — Reprint from "Annales de la Station Centrale Suisse de Météorologie." Published by City-Druck AG., Zurich.

Die Grundlagen der Verkehrswirtschaft, by Prof. Dr.-Ing. Carl Pirath. Second, enlarged Edition. — Published by Springer-Verlag, Berlin.

Kleine Raketenkunde, by Hans K. Kaiser. — Published by Mundus-Verlag, Stuttgart.

Mitteilungen aus dem Institut fur Flugzeugstatik und Flugzeugbau of the Swiss Federal Institute of Technology. Edited by Prof. E. Amstutz. — Published by Verlag Leemann, Zurich :

No. 2. *Zur Statik von Dünnen Flugzeug-Tragflächen,* by H. Schürch.

Mitteilungen aus dem Institut für Aerodynamik of the Swiss Federal Institute of Technology. Edited by Prof. Dr. J. Ackeret. — Published by Verlag Leemann, Zurich.

No. 16. *Die linearisierte Theorie der dreidimensionalen kompressiblen Unterschallströmung und die experimentelle Untersuchung von Rotationskörpern in einem geschlossenen Windkanal,* by Edward R. Van Driest.

No. 17. *Experimental Investigation of a Stationary Cascade of Aerodynamic Profiles,* by William T. Sawyer.

Echelles de Conversion des Unités Anglo-Saxonnes en Unités Métriques, by J. Bernot. — Published by Dunod, Paris.

Die Probleme des neuzeitlichen Luftverkehrswirtschaft unter besonderer Berücksichtigung der Wirtschaftlichkeit, by Hans Joachim Pirner (Doctor's thesis, Munich University).

Publications Scientifiques et Techniques du Ministère de l'Air. — Distributed by Service de Documentation et d'Information Technique de l'Aéronautique, Paris : *Leçons sur la Résistance des Fluides non Visqueux,* by Paul Painlevé. Vol. II.

No. 234. *L'Etude des Jets et la Mécanique Théorique des Fluides,* by Adalbert Oudart.

No. 235. *Nouvelles Méthodes de Préparation des Cristaux Uniques d'Aluminium et leurs Applications à l'Etude Microscopique et Cristallographique de l'Etat Métallique,* by Louis Beaujard.

No. 236. *Contribution à l'Emploi des Méthodes Optiques en Métallographie Microscopique, Application aux Bronzes, aux Alliages Cuivre-antimoine et à une Série de Siliciures,* by Théophile Cambon.

No. B.S.T. 112. *Détermination d'un Etat Plan des Contraintes à l'Aide d'un Extensiomètre à Résistance Electrique à Trois Directions (rosette) — Abaques Pratiques d'Emploi,* F. T. Salles.

No. B.S.T. 113. *Restitution Planimétrique des Photographies Aériennes, Instruments et Méthodes,* by B. Dubuisson.

Mécanique de l'Aviation : Propulsion et Performances, by Pierre de Valroger. — Published by Gauthier-Villars, Paris.

SE 2010 "ARMAGNAC"

Of all the prototypes which the French aircraft industry demonstrated to the public at Orly Airport at the conclusion of the Paris Aircraft Show of 1949, the SE 2010 "Armagnac" four-engined long-range commercial transport no doubt left the most lasting impression. It is less the dimensions of this largest landplane ever to be built on the European Continent or its flying performance which won recognition at first sight for the design team of the SNCA du Sud-Est, than the pleasant lines of the Armagnac and the conviction that the successful conclusion of the first development stage held considerable promise for the future.

However, impressions gained during a single demonstration may be deceptive. To the uninitiated spectator they do not give an accurate picture of the work that goes into building such a giant aeroplane. Today, as the SE 2010 is about to enter upon the final stage of her flight test programme, it may prove of interest to take a look behind the scenes. The following pages contain an account of a trial flight of last year's initial test phase, as well as a report on the measuring methods employed during the flight and on the extensive organization which is required to produce the aircraft in numbers. Pictures of structural details and a detailed description of the development of the landing gear—this, too, is continuing, for any increase in the gross weight poses new problems for the landing gear designer—provide a few examples of the detail work upon which the success of such a vast project depends.

This detail work is one of the major factors attracting the attention of the critical observer of the French aircraft industry. It has frequently been said that this industry was diluting its energy by designing and building an excessive number of prototypes without devoting sufficient attention to the development of these types up to the production and operating stage. Frequently, it is asserted, a prototype was designed and built, test flown and subsequently abandoned, chiefly because the aircraft was of no utility. This, it is claimed, was done chiefly in order to keep some design office or other going. The "Armagnac" has little in common with such a programme. From the beginning its design arose out of the desire of the French aviation authorities to place at the disposal of Air France within the shortest possible time a number of modern operational long-range transport aircraft built by the French aircraft industry. In order to save time, a production order of relatively important size, considering the size of the aircraft type itself, was placed at the same time as the prototype contract. This is a procedure which demands the greatest efforts from all concerned and forces them to give most careful consideration to any measure to be taken and, if adopted, to carry out the necessary steps emphatically and without hesitation. Unplanned experimentation, innovations merely for the sake of originality were inadmissible.

It is idle to speculate today whether or not the development of the "Armagnac", the elimination of all the difficulties which obstructed the quantity production of the type, can be accomplished in time to attain the aim which was originally set. Granted, six months after the "Armagnac's" initial flight a jet-propelled airliner prototype took to the air for the first time; granted faster aircraft nearly equal in size have been in operational use on the air lanes of the world for months, Nevertheless, it is to be expected that the "Armagnac" will serve its buyer as a useful and a good aircraft. Chief of all, there is not the slightest doubt that the French aircra t industry as a whole will draw lasting benefit from the executive personnel who have had an opportunity of training their minds and discipline in the production of this type.

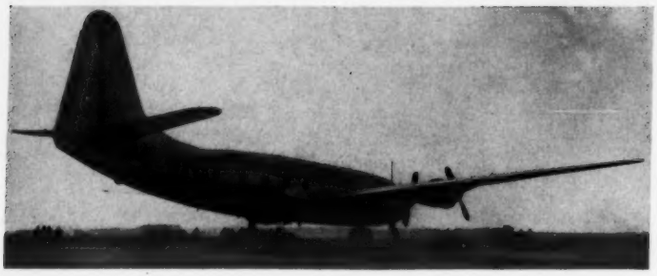
* * *

Long ago, in the inaugural issue of this magazine, published in April, 1946, we had occasion to draw attention to the SE 2010 project and its early history. Let us briefly sum up :

At the beginning of 1942, at a time when the Nazis still occupied the country, preliminary design studies for a commercial airline for one hundred passengers were initiated. The type was tentatively designated Model 052 and was to be powered with Hispano-Suiza 12 twelve-cylinder engines or with Gnome & Rhône 14R units of 1,200 H.P. Soon it was discovered that these engines were not powerful enough.

On September 18th of the same year the design office of the SNCA du Sud-Est submitted a more promising advance project. The type described was designated SE 2000 and was to be powered with Gnome & Rhône eighteen-cylinder engines of the 2000 H.P. class. With a take-off gross weight of 94,800 pounds the SE 2000 would have been able to carry 40 passengers and 6,600 pounds of cargo on the South Atlantic route at a speed of 250 m.p.h.; cruising altitude was given as 23,000 ft. The design provided for a two-deck pressure cabin, and the wing, with a span of 138 ft. 2½ in., was to be of single spar design and feature a torsion-resistant leading edge portion.

At the beginning of 1943 more detailed requirements for a South Atlantic and inter-continental transport aircraft were elaborated. The SE 2000 design project was subjected to numerous modifications. The fuselage was given a cylindrical cross section and provided with a single storey passenger cabin, the wing design approached that of today's "Armagnac", the cruising altitude was reduced to 19,700 ft. and the gross weight increased to 97,000 lbs. Alternately, the aircraft should have been capable of carrying 32 passengers and 7700 lbs. of cargo over a range of 1,860 miles, or 82 passengers and



7050 lbs. of cargo over a distance of 620 miles. On August 12, 1943, the company was awarded a contract for the construction of a prototype.

Following the liberation of France, preliminary work proceeded at a more rapid pace. New data permitted an increase in maximum gross weight to 141,000 lbs. Air France also expressed the wish to operate the aircraft on the North Atlantic over 2,500-mile stages with an increased number of passengers. SNCA du Sud-Est thereupon elaborated a new project envisaging the installation of 3,500 HP engines of a then new type, the American Pratt and Whitney R-4360 "Wasp Major". The wing span was increased to 160 ft. 7 in. which, combined with greater wing loading, permitted an increase in the take-off gross weight to 154,300 lbs. Thus, the basic design of SE 2010 was born.

On March 12th, 1945, the company was awarded a contract for a prototype, and on May 16th an order was placed for a production series of 50 units. Subsequently this number was reduced to fifteen.

In the course of later developments, new structural specifications made possible an increase in the take off gross weight to 161,000 pounds. On the other hand, ICAO specifications required an increase in the fin and rudder area by 50%, so that the forward surface of the box type fin spar had to be redesigned to form an angle with the oblique cross frame of the fuselage rear carrying it.

* * *

On January 13th, 1949, the SE 2010, which had meanwhile been christened the "Armagnac", took to the air for a brief period under the control of Chief Pilot Nadot and thus concluded its taxiing trials. After that it was taken back into the assembly shed and fitted with extensive measuring and recording equipment. Full-scale flying trials started on April 2nd with a test flight of 55 minutes' duration. The trials continued according to schedule until the middle of December. During this period the "Armagnac" made 55 flights totaling 145 hours and on several occasions took off at the maximum gross weight of 73 tons, notwithstanding the fact that it had been temporarily fitted with "Wasp-Major" VSB 11G engines of only 3,000 HP.

Following a brief winter interval, which was used notabl to install the final 3,500 HP engines, the second phase of the test programme has now been started in the spring of 1950. This phase will largely serve to determine the ultimate take-off gross weight, the useful load and thus the economic potentialities of this future "flagship" of the French airline system.

* * *

Each one of the provinces of *la belle France* has its own characteristic quality. "Armagnac" is not the Normandy. No "Blue Ribbons" will probably be gained by the "Armagnac", but it will be destined to establish firm ties of trade, commerce and friendship with all parts of the world.

SE 2010 "ARMAGNAC"

Testing the "Armagnac"

BY GEORGES FÉVRIER, PARIS

In the course of 15 years of close contact with the flying world and airmen of all kinds I have often had occasion to discover that pilots dislike journalists. The first time I really felt that they had taken me into their confidence was on the day when Monsieur Vigroux, president of the French Test Pilots Association, introduced me to his colleagues with the words : "Meet my friend Février, he has flown in dozens of aircraft, prototypes and all. He is no journalist, he is a test pilot".

Never has a compliment given me more pleasure. All the same it was not quite justified, even though I had made my first flight before the war—the first one—at the tender age of six and have since spent three hundred thousand miles in the air. Although I have often flown in prototypes and in aircraft still in the experimental stage, I had never taken part in any full-fledged test flights. This gap has now been closed. A few weeks ago I rode along on the SE 2010 "Armagnac's" thirty-fourth trial flight. I am told that in every respect this flight resembled the thirty-three preceding ones.

* * *

At 2250 hours I had left Paris on the night aeroplane, and at 0300 the next morning I went to bed at the Hotel du Grand Balcon

at Toulouse. This was the hotel at which all crews flying the historic Toulouse-Casablanca experimental route used to stop over. Four hours later I was up and about. Bad luck. The sun was shining in torrents and the clouds were right down on the deck. "Missed it", I thought, "we shan't fly today".

At 1100 hours I arrive at the airport. The weather reports are none too good, but Chief Pilot Nadot nevertheless orders the aircraft to be trundled out from the hangar.

"We shall take off in three-quarters of an hour", he says to me. "The police need that much time to barricade the road which crosses the runway". The normal runway of the Blagnac Airport is too short for a 70-ton aircraft. So they extended it—on the other side of the road.

Nadot's second pilot, Leo Galy, draws me into his office. "We are going to climb pretty high. You had better dress up like a pilot".

As I am pulling on my brown overall I can see the mechanics towing the aircraft on to the tarmac, connecting the telephone line to the fuselage—like a steamship arriving in port—and placing the red-and-white barriers to keep out the curious.

There are seven of us : Nadot and Galy, pilots; Preneron, radio operator; Leroy and Avril—the latter's name is synonymous to mine, by two months—flight engineers; test engineer Beteille, and myself.

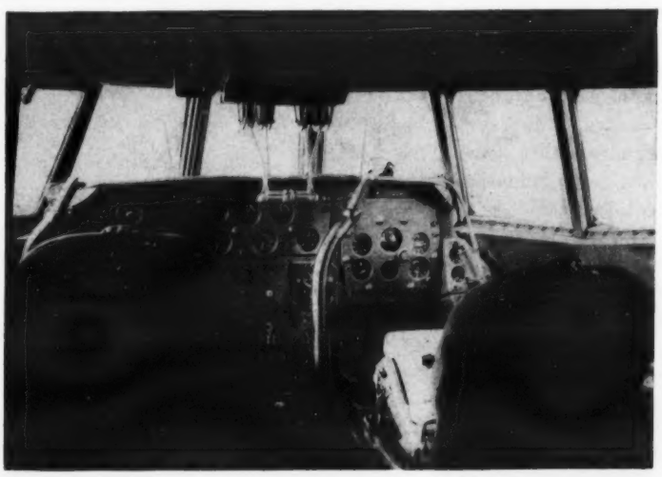
The steps are withdrawn, the door is closed, we are "alone at last". Avril straps a parachute to my back—I had forgotten that the thing was so heavy. "You know how to use it? Good, the escape hatch is here. You will be the third to jump, don't forget to get hold of the line hanging from the roof when you get out... A mere precaution, everything will be okay. Here is your crash helmet, your throat microphone, your oxygen equipment..."

In the port pilot seat Nadot rattles off a long list of control handles, knobs and readings like a litany. As I listen the slight shudder which had crept up my back at the idea of a possible parachute jump vanishes.

In my headphones I hear sounds resembling the responsories of a giant choir. Following the removal of the outside telephone contact, at the same time as the removal of the red and white barriers, the choir is reduced to our septet.

At 1200 hours sharp the SE 2010 begins to move. Her ponderous, heavy gait is more like that of a tank—a very heavy tank indeed—than that of an aircraft. We reach the end of the runway. Nadot turns carefully, for the runways are narrow for such a monster, reverses the propeller blades in order to move back as far as possible.

At each of the two pilot seats the conventional control column and wheel has been replaced with two separate sticks movable only fore and aft (the grip of the co-pilot's starboard stick is visible in front of the two instruments at extreme right). Simultaneous movement of both sticks operates the elevator, differential actuates the ailerons.



"All clear?" — "All clear".

With a heavy leather helmet on his head, each one of us sits at his station. Full power. Slowly at first, gradually picking up speed, the aircraft moves down the runway. The stroke of the landing gear shock absorber struts is so long that for the first time in my life I don't notice the actual take-off.

Nadot, who from his seat can see neither the engines nor the airscrews, not to mention the ailerons, is talking to Beteille. The latter is preparing his records, his station illuminated by a brilliant light, like the studio of a phototrapher.

The "Armagnac" is still climbing... All I can recognize of Toulouse are the rusty brown roofs of the buildings. I open the oxygen valve.

The test starts. A programme covering four typewritten foolscap sheets has been worked out for this 34th flight. In stages the aircraft climbs to 18,000 feet, then 20,000 feet and finally to 20,500 feet.

Nadot, who so far has spoken only in figures, shouts into the interphone :

"Reduce power, close gills... take care of your ears!"

In effect, we are descending at about 35 ft. per second, at a forward speed of between 360 mph. and 375 mph.

No noise, not a single vibration, practically no feeling at all. Owing to the design of the aircraft I hardly noticed the steep descent. Without the feeling in my natural barometers—my ears—and the readings on the instruments facing me I wouldn't know that we are going down.

* * *

The next test is designed to determine what deflection of a certain servo tab on the elevator is necessary at various speeds and a certain load distribution to maintain uniform level flight. While Beteille pumps ballast water from one tank into another in order to shift the center of gravity in the desired manner, the rest of the crew pause for lunch. From the boxes which a well-known caterer of Toulouse has sent to the airport I take hard-boiled eggs, smoked ham, cold chicken, fruit, pastry and an excellent Burgundy wine.

Luckily we are flying at only 8,000 feet. It would have been difficult to eat lunch at great altitude while maintaining the oxygen equipment in position.

It is very impolite, children are told, to speak with one's mouth full. But after the monotonous mathematical dialogues between Nadot and his collaborators we seize the opportunity to chat somewhat more leisurely.

The sensation, with which bomber crews are familiar, of speaking simultaneously to several persons via your throat microphone and to listen to the remarks and answers over the headphones is very peculiar. All those participating in such a conversation seem to resemble members of a single body with a single brain. This sensation is accentuated by the fact that you simultaneously feel the impressions described by the other "members". Even the throat microphone, which relieves us of the necessity of using our mouth to any great extent, contributes to this union. *Sotto voce* asides are quite out of the question. Each one speaks on behalf of all and all speak to each individual, and all can communicate among each other only via the mutual nerve system.

More than jointly experienced dangers, more than tedious daily work carried out in common, this merger of widely different personalities helps to explain the ties of friendship—I would like to say kinship—which unite an aircrew.

Despite the luncheon break the crew's attention does not waver. "Oil pressure in number 3 engine is dropping..." The serious voice interrupts the teasing to which Avril is subjected because he has forgotten to order the black coffee.

Test measurements are resumed. "Beteille", says Nadot (I know it is he, although I do not recognize his voice; the intercom

levels all voices and deprives them of the personal timbre. This enhances the unique impression which I have just tried to convey), "Beteille, record at indicated airspeed 174".

"Recorder ready".

And Nadot reports figures :

"Stick position, 380; on the Jaeger, 987; nose 5 degrees up".

A hundred times, each time with insignificant modifications, everyone performs the same manœuvre. Test flights have long ceased to be breath-taking nose dives, or high-speed spurts over the measured distance. Today they are characterized by the endless patience, by minute attention to detail which allows everything to be seen and to be foreseen.

In this respect the flying trials of the 2010—a programme over about 250 hours of flight—can be quoted as an example. The preparation of the flight, the plans established prior to each take-off, the order and discipline of their execution, they all avert the wastes of time and failures which otherwise would drag out the testing period over years. Nadot has worked out this programme. With his crew—all six men, always the same, take part in all the flights—he rehearsed this programme over several weeks before the initial flight, and now he is carrying it out with clockwork precision.

Thus each test flight produces a full crop of figures, charts, recordings and photographs. All that is necessary is to interpret and assess these data.

Not a single test has had to be repeated since the programme was started.

* * *

We climb, dive, climb again. Each time we exchange oxygen for champagne. A highly commendable cocktail.

All the planned recordings have been made, the landing gear is lowered, the water ballast jettisoned—we must touch down at a gross weight of not more than 126,000 pounds. Another litany of control handles, knobs and readings. About three hours after the take-off we land as smoothly as we started : quite impossible to determine the actual moment of touch-down.

Freed of my harness, a private individual again, I prepare to get out. Get out? Come again! The steps are there, but about three feet away from the fuselage. Each member of the crew has to contribute to the test report before he is allowed to set foot on the earth.

Nadot opens a red booklet and, exactly as he would do it at his desk in an office, he begins to jot down :

"Adjustments to be made after flight 34 : number 1 vacuum pump to be inspected..."

* * *

SE 2010 "ARMAGNAC"

Purpose and Means of Flight Testing

The buyer of a commercial transport aeroplane is entitled not only to expect his aircraft to fly with a maximum degree of safety : today he may insist on numerous requirements being met regarding performance, flying characteristics, robustness and long service life, and ease of maintenance. It is up to the project, design and development staffs to ensure that the new aircraft is capable of meeting such specifications.

Only by testing can a check be made on the successful achievement of these aims. For even the most carefully thought-out inventions and devices may turn out to be failures, and time and again entirely unpredictable factors may arise. The flight-test programme is therefore established for the purpose of providing information on all characteristics and peculiarities of the aircraft. Favourable prognostics must be confirmed in practice, deficiencies must be discovered to make possible their early elimination.

The Test Programme

To fulfil this overall task, a detailed programme was established for the testing of the SE 2010. This is now being executed in three principal stages.

(1) In the first phase of the tests the aircraft is to be made fully airworthy as quickly as possible. Included is a preliminary adjustment of the controls, adjustment and correction of the automatic piloting instruments, checks on the functioning of the various installations and services, elimination of any defects in these installations.

(2) The second series of tests serves to effect a final determination of flying characteristics and, if necessary, to improve them. At the same time the entire equipment is operated under maximum stresses in order to ascertain its operational robustness. The crew will also observe whether or not these installations are easily handled.

(3) The third and last phase of flight testing is devoted to the systematic determination of the aircraft's performance in its final form :

(a) Determination of take-off and landing distances, runway requirements and behaviour in the event of engine defects;

(b) Recording of performance in flight and ascertainment of data for the economic operation of the aircraft.

Throughout the third test phase checks on the reliability and ease of handling of all equipment and services are continued.

Testing Equipment

Special equipment fitted to the aircraft serves, on the one hand, to place the aircraft easily in the condition at which its behaviour is to be tested and, on the other hand, to make the necessary measurements and recordings.

The test engineer's station with its multiple measuring and recording instruments : at left the Brown recording instrument, at right the main instrument panel and the motion picture camera mounted before it.

Another motion picture camera recording set is mounted in the cargo hold.

The Brown recording instrument for the simultaneous registration of 144 temperature readings.

The first of the two purposes is accomplished by a system of sixteen water ballast tanks with a capacity of 155 Imp. gals. each, interconnected by a series of pipes. Stop valves permit jettisoning of the water ballast or its transfer from a forward to a rear tank and vice-versa. Hence, the load distribution (centre of gravity) of the aircraft can be adjusted according to a predetermined plan. Flight tests may necessitate immediate landings directly after take-off. Should such an emergency occur, the jettisoning of the water ballast would speed up the reduction of the aircraft gross weight to the maximum permissible landing figure without wasting valuable fuel, such as would be inevitable in normal operations under similar circumstances.

The measuring equipment includes electric and other lines through which required data may be "tapped" at any desired point and transmitted to the measuring instruments. The system of circuits branches out into every part of the aircraft (power plant, wing, landing gear, tail surfaces, etc.), whereas the actual recording instruments are grouped together at the station of the test engineer in the forward cabin. These instruments are divided into four main groups.

(1) *Recording camera :* On a well-illuminated panel indicating instruments are mounted for the main data of the flight (speed, height, engine speed, engine boost pressure, flap deflection, etc.) and for the specific studies to be conducted in each flight (*e.g.*, pressures at certain points of the fuselage, in the air intakes, in the engine nacelles). The panel has room for 48 large-dial instruments. A camera records all readings simultaneously on a 35-mm film and not only enables the test to be observed during its execution but also makes possible its leisurely interpretation afterwards.

(2) *Hussenot-Baudouin Recording Instruments :* A group of three multiple recording instruments plots the values to be measured on light-sensitive paper strips. Each of these instruments incorporates a clockwork which moves the sensitive paper mounted behind a narrow slot, as well as an electric bulb with a straight filament. The housing of these instruments also contains a variety of other indicators (altimeter, manometer, galavanometer, self-adjusting potentiometer, spirit levels, accelerometer, etc.). Their readings are transmitted to a small hollow mirror which reflects the image of the bulb filament to the slot. Variations in the measurements produce a shifting of the light beam penetrating through the slot, so that they are directly plotted on the moving paper strip as a continuous curve. Each of the three instruments can simultaneously record up to 20 measuring values.

(3) *Temperature Measuring Equipment :* At all points at which measurements of temperature are to be made, iron-constantan thermo elements are fitted, whose electric circuits are connected to an automatic Brown recording instrument. This permits direct reading and recording of 144 temperature indications within a range from minus 80 deg. to plus 300 deg. Centigrade. There are up to 125 measuring points on each engine (cylinder heads, spark plugs, crank case, accessory section, elastic suspension, etc.) as well as about 700 points on the wing and empennage skin to control the effectiveness of the thermal de-icing system, on the wheels to record the brake temperature, as well as at many other points subjected to heat.

(4) *Extensometers :* To numerous points selected for study during strength tests, strain gauges have been cemented. Special circuits connect them with a "Telec" instrument which on special paper simultaneously records the strain values at fourteen points, as well as with a "Sextat" group of instruments recording strains at one single point. This group comprises a cathode ray oscillograph and a motion picture camera and serves mainly for vibration studies.

In addition to these four main installations, numerous measuring instruments such as barographs, pressure gauges, recording revolution counters and gyro instruments with recording devices are provided. Instruments for investigation of special problems, particularly for noise level measurements, cabin air conditioning checks, etc. are fitted as needed. Furthermore, coding or signal instruments are provided to mark the elapse of time on different recording tapes taken at the same time.

For the fuel consumption tests the panel facing the recording film camera will be replaced with another which, apart from the instruments indicating the flying condition of the aircraft, will contain gauged glass fuel containers. The beginning and the end of the emptying process will be recorded on the film together with the second-hand position of the chronometer, so that the hourly fuel consumption of the engines can readily be ascertained.

★ ★ ★

Producing the "Armagnac"

To appreciate the achievement represented by the design and construction of the first SE 2010 "Armagnac" commercial airliner prototype, it may be well to take into account not only the unusual size of the aircraft but also the general situation of the French aircraft industry at the time of its development. The design contract was placed on August 4th, 1943, and the prototype was ordered on March 12th, 1945. Building the aircraft meant that enormous difficulties, provoked by the occupation and the direct effects of the war, had to be surmounted. Evidence that the design office of the SNCA du Sud-Est successfully performed this *tour de force* was the impressive participation of the "Armagnac" in the Orly flying display of May, 1949.

The second milestone in the history of this aircraft is the smooth planning and execution of the flight test programme. The extent of this programme, which was worked out in every detail, in advance reflects the size of the aircraft type. Until the interruption of the tests last winter—the interval being used to re-equip the type with more powerful engines—the "Armagnac" had made 55 flights of an aggregate duration of 145 hours.

Results so far obtained from the test flights show that the initiation of series production parallel to the manufacture of the prototype was not a premature step. The adoption of this procedure was indeed essential in order partially to make up for time which the French aircraft industry compulsorily had to waste during the war. This decision permitted a gain of at least two years and will assure France of an honorable position in the international air transport field.

A main rib on the wing's box-type girder on the assembly bench.

Structure of the box girder in the vicinity of the inboard engine nacelle. At extreme left a solid-plate rib (fuel tank wall, interruption of longitudinal stiffeners; at this point the skin is reinforced by external and internal fish plates). In the centre of the picture three main ribs, behind the concrete pillar another solid plate rib, at right an auxiliary rib.

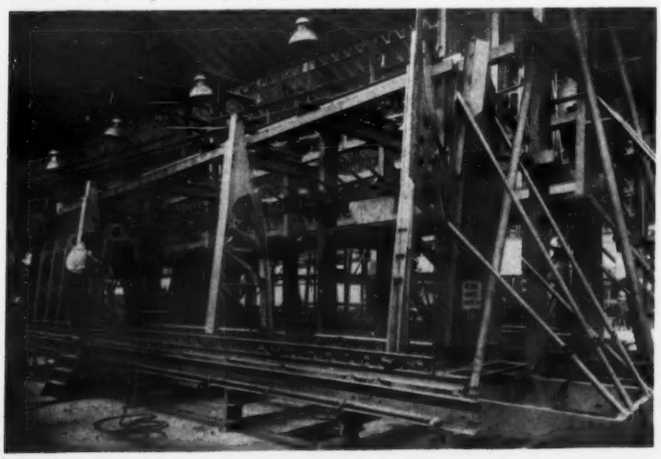
Thus, the manufacture of fifteen "Armagnac" airliners represents the third development phase of this great undertaking. Production started parallel to the manufacture of the prototype and today is being pushed energetically while the prototype is undergoing its flying trials. The problems posed by this procedure and their solution make interesting reading.

Prototype Construction and Series Production

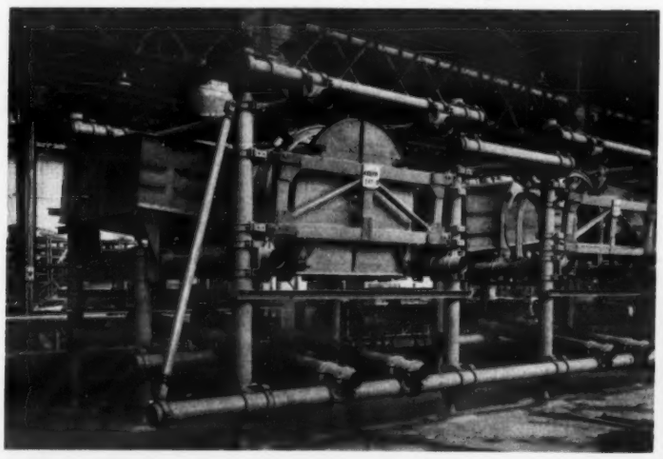
Producing aircraft in any quantity on the sole basis of detailed and rigid blueprints is —wishful thinking. Modifications which are revealed as necessary during the production process cannot be forecast while the type is being designed. The solution of problems arising out of such modifications is the daily task of the production engineers. But it is obvious that added difficulties must be overcome if production arrangements have to be made while the design details of the prototype are still in the process of being determined one by one. This was precisely what happened in the case of the "Armagnac".

The success of this attempt depended largely on the far-sightedness and experience of SNCASE's project and design engineers. With the constant aim of putting the aircraft into quantity production, and not merely of completing a prototype, the designers carefully avoided the most comfortable method of solving production problems, which consists of passing them on to the production engineers. Extensive preliminary investigation and calculation, frequently supplemented by tests of individual components, made it possible to issue contracts for the main production aircraft assemblies

Structure of wing trailing edge portion in the assembly jig.



Mounting the engine nacelles on a mock-up of the box girder.



in their final form at the same time as those for the corresponding assemblies of the prototype. The strength tests of fuselage and wing—the most extensive ever to be conducted in France—have confirmed the accuracy of the design and calculating methods employed. This fact proves that the decision simultaneously to start work on the prototype and the production models was sound. Under bending tests the wing failed precisely at the predicted point, and test results have shown that the take-off gross weight of the SE 2010 could safely be increased to 80 metric tons, or even to 85 tons on condition that additional fuel tanks be installed in the outer panels.

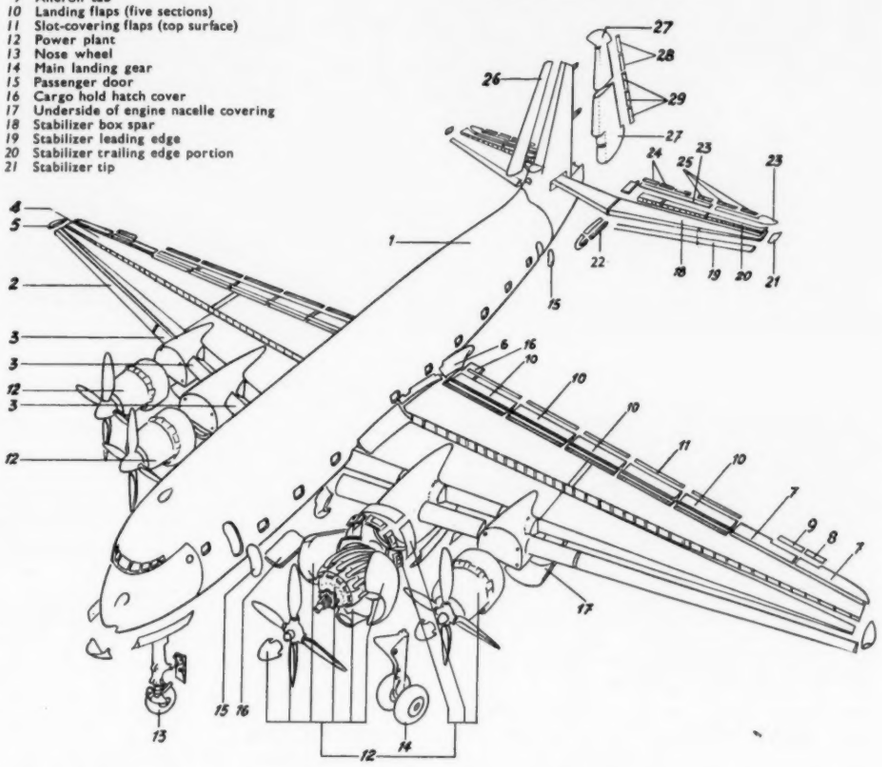
The final design of other assemblies, such as the empennage, required tedious and delicate aerodynamic studies. Their construction was authorized only at the last moment.

The most important source of major modification was, as expected, the equipment and accessories to be installed in the aircraft. It is these installations which, together with the engines, keep an aircraft in the air. Each item of equipment, with its sensitive instruments and miles of cables and circuits, is a unit in itself and involves vast amounts of work by highly specialized engineers. In order to develop the aircraft to the fully operational stage, to meet all the specifications of Air France, to make use of the latest experience gathered in international air transport operations, to give consideration to the ever-changing interior accommodation projects and, finally, in order to fit American and French instruments as available, complete systems of circuits and even parts of the airframe itself had to be modified. On the whole, however, these delays were largely compensated by the overall gain in time.

Sub-assemblies and Production Methods

For ease of production and for organizational reasons (quick dismantling, transport and storage of major components), the SE 2010 is divided into eighteen sub-assemblies, as illustrated.

1 Fuselage + wing spar girder + engine nacelles
2 Outer wing panel leading edge
3 Hinged wing leading edge
4 Wing trailing edge
5 Wing tip
6 Fuselage-wing fairing
7 Aileron (two sections)
8 Automatic aileron tab
9 Aileron tab
10 Landing flaps (five sections)
11 Slot-covering flaps (top surface)
12 Power plant
13 Nose wheel
14 Main landing gear
15 Passenger door
16 Cargo hold hatch cover
17 Underside of engine nacelle covering
18 Stabilizer box spar
19 Stabilizer leading edge
20 Stabilizer trailing edge portion
21 Stabilizer tip
22 Fuselage-stabilizer fairing
23 Elevator (four sections)
24 Automatic elevator tabs
25 Elevator trim tabs
26 Fin leading edge
27 Rudder (two sections)
28 Rudder trim tabs
29 Spring-loaded rudder auxiliary tabs



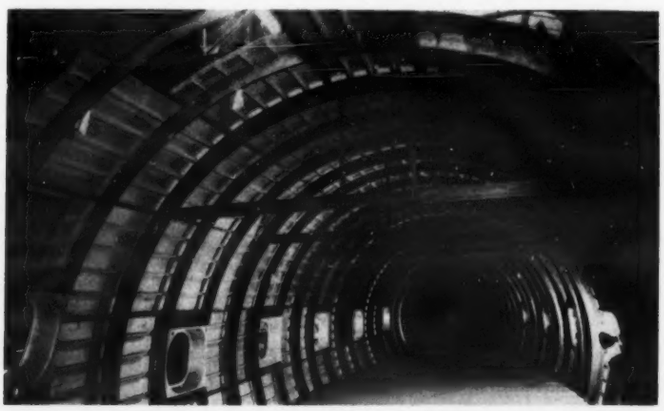
Economic production was made possible not so much by highly-efficient production methods—the benefits of which would have been negligible in view of the small number of aircraft to be built—as by simplicity of design. Chief of all, the design engineers made the widest possible use of the well-known advantages of electric spot welding. This resulted in a considerable saving of weight, smoother surfaces, smaller reduction in the strength of metal sheet and tighter seams than would have been possible by riveting.

The main girder of the wing is an undivided box-type structure passing through the fuselage. Little would have been gained by manufacturing it in several sub-assemblies, since the advantage of easier transportability in case of wing damage would not have outweighed the constructional drawbacks. Flanges and webs of the box spar consist of sheets of uniform gauge; sheets of tapering thickness, which would have given a substantial saving in weight, were not available in time.

The monocoque fuselage is composed of

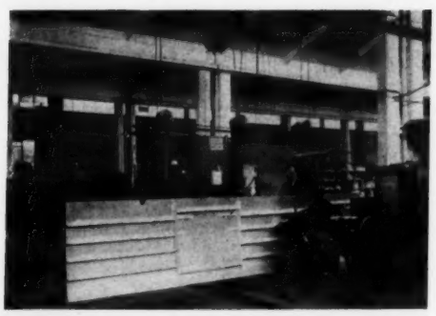
Part view of the La Courneuve plant. In foreground assembly of a wing leading edge portion.

Monocoque construction of the fuselage centre portion. Every third cross frame and every fifth longitudinal stringer is riveted to the skin.



Manufacture of cross frames at Toulouse plant.

Fuselage structure of prototype. The cross frames mounted on the jig are used to adjust the longitudinal stringers and for the "stitching" of the skin panels. In the series production process this work is done on special forming jigs.



Spot welding of the "stitched" stringers to the skin panels, measuring about 15 feet in length. In final assembly the overlapping and Fairprene-sealed panel edges are riveted on to further longitudinal stringers of the structure.

three portions : pressure cabin, nose section and empennage section. The pressure cabin has circular cross frames and longitudinal stringers of rolled Z-shaped sheet sections, covered with Vedal.

The design of the landing gear is described in detail on pages 144 to 146.

Dispersal of Production

Production of the SE 2010 was undertaken by four widely-separated plants. Main tractors were :

Toulouse plant of the SNCA du Sud-Est :

Pressure cabin
Nose section
Final assembly

Marignane plant of the SNCA du Sud-Est :

Main spar unit

La Courneuve plant of SNCA du-Sud-Est :

Wing leading edge section
Wing trailing edge section
Wing tips
Engine nacelles

Colombes plant of SNCA du Centre[1] :

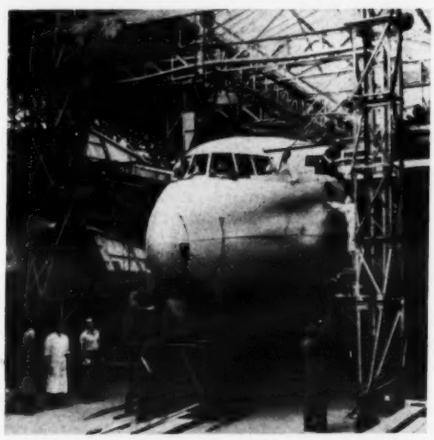
Landing flaps

[1] The liquidation of SNCA du Centre and the closing of the Colombes works have interfered with the smooth progress of the production programme. The work involved has meanwhile been taken over by the SNCA du Sud-Est.

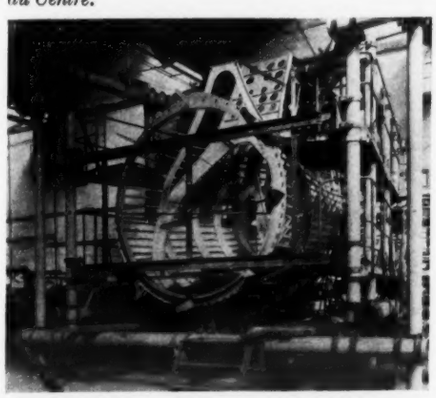
Ailerons
Complete empennage
Rear fuselage section.

One of the main purposes of this dispersal was to make full use of locally available labour and thus to diminish the over-all production time. In the production of the box-type spar girder use was to be made also of the experience which the Marignane works had gathered in the manufacture of large box spars with integral fuel tanks for the SE 200 flying-boat. Another reason for the decentralization was that the pre-

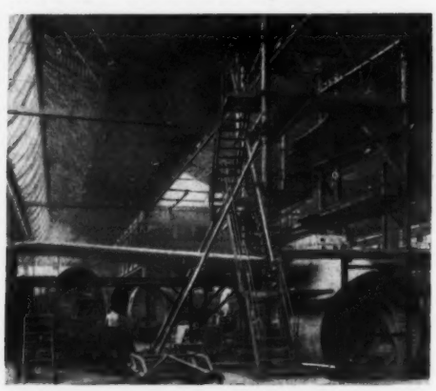
Mounting the nose section to the central fuselage (the latter has its own pressure-tight forward wall). The extremity of the nose section is indicated by the hands of the workmen holding it by the edge.



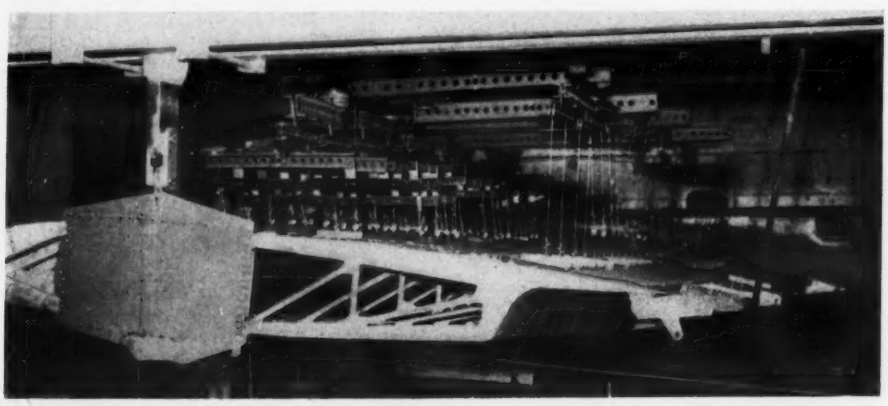
Rear fuselage structure in its Henschel tubular jig at the Colombes works of the former SNCA du Centre.

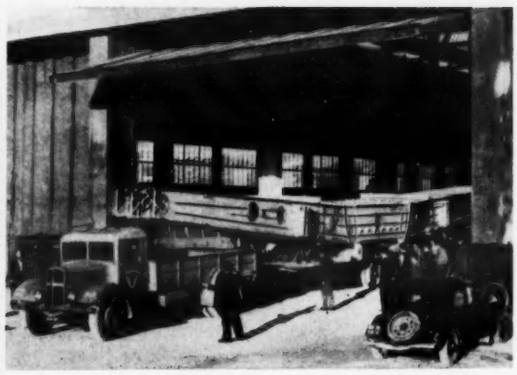


The elevator unit has been adjusted.



Static load tests of an outer wing panel confirm the engineering data.





A "rally" was organized to take the major components to the final assembly sheds of Blagnac and Saint-Martin at Toulouse airport: the rear portion of a central fuselage leaves the Toulouse plant... ...whereas the box girder of the wing emerges from the Marignane factory at Marseille.

parative work preceding actual manufacture required large numbers of personnel. It seemed logical, therefore, to spread this work, notably the design of jigs, over a number of relatively small design offices, each one of which was assigned a limited number of well-defined problems. Under a long-range plan it was proposed that in future the various teams should be charged with the design of corresponding components, together with their jigs and installations.

This dispersal of the manufacturing effort has its drawbacks. The distances between design offices and manufacturing plants does not facilitate the solution of problems arising in actual production. The individual plants employ different working methods. And care has to be taken that the sub-assemblies fit precisely in spite of the fact that they are built under differential temperature conditions and are subjected to long journeys by rail.

Difficulties of this kind were eliminated by the appointment of permanent liaison offices, by friendly and close collaboration between the design offices and work shops, by full-size lithographed lofts and by carefully thought-out design of assembly jigs and scaffolding.

Procurement of Materials

As a matter of principle, only currently available materials of standard size were used. One of the results was, as mentioned above, that it was not possible to use sheets of tapering thickness. The fact that procurement difficulties arose nevertheless was not due to any complexity of design but to the general unfavourable procurement situation of the post-war period.

As from the ninth production aircraft, a new high-strength light alloy called Zicral will be substituted for the duralumin in the preceding machines, which will result in a weight economy of 1,440 lbs. Zicral will be used only for the fuselage and empennage covering, since all box girders of the wing have been completed.

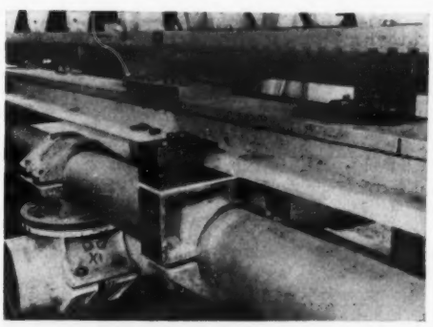
Production Methods and Equipment

Only a few components which could not be chased by hand or which were required in considerable number for each aircraft were produced by stamping on dies in a hydraulic press. For example, window frames were manufactured with a 1,850-ton press, fish plates, angle fittings, hinges, etc. were made by mechanical presses. Most dies, particularly those used for the stiffening of thin sheets, are standardized.

All sheets were cut by Wadkin or Onsrud machines with the aid of templates. The dies used were generally of cast duralumin. They are much more durable than wooden dies with or without metal covering, they are easily manufactured and can be melted down after use.

A lot of detail work had to be accomplished in the erection of jigs, scaffolding and other installations needed for final assembly. This equipment was designed for a total production series of fifty aircraft at a monthly rate of two-and-a-half units. The prescribed delivery periods made it necessary to prepare these installations already before the factory blueprints for the various aircraft components has been completed. Furthermore, they were to be used in the construction both of the prototype and the production aircraft. Owing to the difficulties in material procurement of that time, they were knocked together from widely differing components. One result is that some of the scaffolding is a little on the heavy side, but this has had no detrimental effects—on the contrary, it was appreciated that the combined weight of a large number of employees simultaneously working on the scaffolding did not produce any unpleasant bending phenomena. For the fuselage and the trailing edge portions of the wing, assembly jigs have been welded together from American extrusions; fuselage rear, fuselage nose and box spar of the wing were built in Henschel tubular jigs. In addition, structures combining welded steel tube frames and concrete or cast steel pillars were made.

In order to guarantee the interchangeability of the structural components, allowance had to be made for the differential extension under the influence of heat of steel and duralumin. Calculated over the entire wing-span, this differential would have produced discrepancies of about one-quarter inch. The fittings required to hold the individual elements together were therefore fixed to special freely contracting and expanding duralumin beams.



Close fit of long parts (in the above case half of an empennage leading edge hinge) in spite of temperature differences in the various manufacturing plants is guaranteed by the insertion of duralumin I-beams in the jigs. These beams possess the same rate of elongation under temperature as the components to be built.

Present State of Production

The photographs on these pages illustrate the progress which has been made in the production of the main assemblies. Not disclosed is the fact that practically all components making up these assemblies have been completed. Work on the sub-assemblies has made more or less progress in different cases, depending upon the time at which they are required for final assemblies.

In addition to the prototype, designated No. 01, which is now undergoing tests, a total of fifteen aircraft is at present on order; these machines are designated Nos. 1 to 15. The first production machine, No. 1, will be completed by the middle of this year. It will be subjected to the usual operational tests on commercial air routes and will then be given the passenger accommodation which has been designed in collaboration with Air France. No. 2 aircraft is also to be delivered before the end of 1950.

SE 2010 "ARMAGNAC"

France's First Large Landing Gear

By G. Renollaud, Ingénieur A. & M., Paris

At the time the problem of developing a nose-wheel landing for the 52-ton SE 2000 long-range transport aircraft became acute, the largest undercarriage ever built in France was that of the 22-ton Bloch 160 or "Languedoc", which was of conventional tail-wheel design. The only tried and proven tricycle then available was the one of the 3,500-lb. Nord 1100 personal aircraft. The landing gear designs of the 10,000-lb. SO 90B light transport and the 15-ton SO 30R medium transport were not finished even on paper and were still farther from being actually built or tested in practice. All that could be done, therefore, was to rely on the laws of similarity in engineering and to make a bold jump from 3,500 lbs. to 52 metric tons.

The present twin-wheel arrangement on the main units was not adopted from the beginning. A comparative study with a single wheel mounted on a cantilever axle and fitted with a low-pressure tire indicated difficulties in the procurement of the necessary tires as well as a weight penalty, and this arrangement was quickly abandoned. Would it be possible to suspend the twin wheels independently of each other but turning in parallel planes? Or should the two wheels be mounted on a common axle, giving the latter the possibility of oscillating through ± five degrees about its attachment point? The twin wheels of American four-engine types which became known in France after the Liberation featured wheel axles mounted rigidly to the shock absorber struts, and it was this solution which was ultimately chosen for the SE 2000.

Shock Absorber Strut Design

(1) *Main wheels :* Thanks to the high degree of freedom accorded by the airframe manufacturers to the designers of the landing gear, the latter were able to base their designs on an extremely simple type of main strut. It is difficult to keep pivots separated by 12 or 15 feet aligned precisely in parallel; any deviation, on the other hand, would increase friction and the danger of jamming. Since supporting struts or main legs supporting the wheels from the outside would have necessitated such pivots, it was decided to discard any design of this kind. Each main leg now consists of a shock absorber built into a box-shaped casing; the foot of the strut supports a single cross axle between the two wheels. A protuberance at the front of the casing is articulated to the pivot about which the entire main unit swings during the retraction process. The casing thus is entirely free of vertical stresses and merely transmits forces from other directions partly towards the forward articulation and partly to an abutment provided with a mechanical blocking device and supporting both the casing and the shock strut.

Hence, the retraction mechanism is simplicity itself. It consists of a hydraulic actuator, the head and piston rod of which are provided with spherical joints and which is attached to a lateral pivot of the shock absorber casing. Equally simple are the locking devices at both extremities of the retraction trajectory. When the leg is lowered, a spring-loaded catch engages a roller located at the upper end of the shock absorber, and upon completion of the retraction process a relatively small up-latch hook arranged forward of the axis of the retraction movement engages the shock absorber leg casing.

(2) *Nose wheel :* The design of the nose wheel leg is similar to that of the main wheels. The only difference is that the pivot is located at the back of the lower half of the casing and the extended leg is held in position by a lock whose sole duty is to prevent movements about the axis of retraction.

(3) *Shock absorbers :* The three shock struts merely are enlarged versions of the well-known D.O.P. design. They feature shock absorbers with mobile cylinders and fixed plunger pistons inserted into them from the top. This arrangement provides optimum protection of the friction surfaces from dust and weather effects. In the main wheel shock struts the bottom of the plunger piston is provided with orifices of constant cross section; for the nose wheel strut it appeared advisable to insert a closure control plate of automatically variable cross section in order to maintain the aircraft's longitudinal inclination as stable as possible during take-off and landing.

The stroke of the shock absorber struts, which was calculated to meet the original specifications, amounts to 23½ inches for the nose wing strut and 25 inches for the main wheel struts. For latest requirements a shock absorber travel of less than half these values would be sufficient, with a resultant reduction in dimensions and weight.

Operation of Retraction Mechanism

The retraction mechanism is operated and controlled by a method which was worked out by the manufacturers as long ago as 1941 and is particularly suitable for large aircraft. In direct proximity of each moving part a special actuator is arranged, the control valves of which are electro-magnetically operated from the cockpit and connect the cylinder with air and fluid accumulators as required. Working pressure is 2850 lbs. per sq. in.

Wheels and Brakes

The wheels consist of an inner element mounted to the stub axle on tapered roller bearings, and of two detachable outer discs which also form the rim. High-grade steel tie bolts connect the three components. The inner element and the outer discs are provided with malleable cast iron brake rings. The two thin, flat brakes are located between the inner wheel element and the wheel discs; they consist of an elastic case which separates two elastic Ferrodo-lined steel discs. From these discs the braking moment is transmitted to components rigidly attached to the wheel axle.

The only part of the entire mechanism in which the simple principle of enlargement was not applicable was the brake operating mechanism. The problem to be solved was to bring into play, within a few fractions of a second, forces of the order of about 200 tons through a foot pedal pressure of not more than 70 to 90 lbs. over a distance of 80 ft. from the cockpit. Furthermore, these forces had to vary instantly in direct proportion to the pedal pressure. It was out of the question to transmit the fluid pressure direct from the pilot's brake control mechanism to the brakes, since the latter operate with a low fluid pressure (110 lbs./sq. in.) but owing to their large surface require a large amount of fluid.

For this reason it was necessary to fit pressure converters in close proximity to the brakes on the shock strut itself. These, too, still require a large quantity of fluid (several hundred cubic centimeters) to enable them to be effective without delay. For each landing gear half, a second control device was installed, the flow cross sections of which are much greater than those of the valves operated by the pilot. This device is located in the corresponding engine nacelle at a short distance from the landing gear strut and its hydraulic accumulator.

The whole system therefore comprises three fluid circuits which operate as follows : the controls actuated by the pilot transfer a few cubic centimeters of fluid under high pressure through a narrow pipe measuring about 80 ft. to the large control valves in the engine

nacelles. These connect the hydraulic accumulators of the brake system with the pressure converters; in this second fluid circuit several hundred cubic centimeters of fluid are moved through pipes measuring twelve to fifteen feet in length. On the low pressure side of the converter a few liters of fluid must pass through large diameter pipes to the brake casings at a distance of about four feet. Thanks to this arrangement, the brakes were actuated during tests within less than one second and respond instantly to variations in the pressure exerted on the pedals.

Tires *

The design of the tires for such a heavy aircraft also posed new problems, especially since the space available in the fuselage and engine nacelles for the retracted wheels is not unlimited in spite of the large size of the SE 2010.

For the original gross weight of 50 metric tons, each of the four main wheels was to be equipped with the largest tire of the standard 7416 series. This tire size, number 22.5 (representing a rim diameter of 22.5 inches) had previously been used for several aircraft types. Inflated to a pressure of 60 lbs./sq. in., it is capable of supporting a load of 12.5 metric tons. The increase in the originally projected gross weight necessitated the adoption of larger tires. The Dunlop works had already developed a range of high pressure tires capable of carrying heavier loads without increase in size. The largest tire of this series is designated number 30 HP and features a nylon carcass. At an internal pressure of 100 lbs. to 115 lbs. per square inch it is capable of carrying a stationary load of 16 metric tons and requires a total load of 57 tons to flatten it out completely. It was this model that was chosen for main wheels of the SE 2010.

The nose wheel was fitted with a number 24 HP high-pressure tire, the normal load capacity of which amounts to 8.2 metric tons. The production version of the aircraft will be equipped with a so called "Low Profile" tire, the outside dimensions of which roughly correspond to those of a normal No. 20 tire and which offers the greatest degree of safety in the event of a blow-out.

Nose Wheel Steering

Up to the end of 1946 it was planned to do without a steerable nose wheel and to use a freely swivelling type instead. However, in view of the excellent results obtained with smaller aircraft, such as the SO 6000, as the SO 94 and the SO 30P, and at the request of Air France, a steerable nose wheel was provided for in the final designs, in order to obviate the necessity of steering the aircraft on the ground merely by the differential operation of the main wheel brakes and by the deflection of the rudder. The steering mechanism is not of the positive type, as in most American aircraft, but operates through the transmission of the wheel strut of a moment proportional to the turn of hand wheel. Tests have not shown any significant difference in operation.

Construction Difficulties

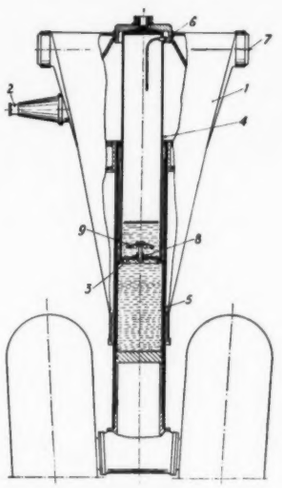
A brief allusion may be made to the multiple problems which arose in the manufacture of numerous components apparently of extremely simple design. In most cases the trouble was due to the unusually large size of these parts which offered many a headache to the sub-contractors.

Thus the outer tubes of the main shock absorbers originally had to be machined from specially forged and drilled steel rods (Claudinon steel works at Saint-Etienne) owing to their length of nearly seven feet and their outside diameter of nine inches. The manufacture of drawn tubes for this purpose was successful only after a year as slag inclusions in the steel ingots time and again produced elongated flaws in the finished tube. The great thickness of the tube wall rendered effective inspection of the tubes extremely difficult, so that checking was finally limited to mechanical methods (elasticity limit above 1.5 times the maximum operational loads).

A more difficult problem was posed by the T-shaped foot of the strut unit, which before machining weighed about 660 pounds each and to which the collars of the two stub axles had to be fastened by means of simple artillary-thread cap nuts. In this case dozens of pieces had to be rejected as defective. On the whole, the inspection of such major components required the employment of every available testing method : fluorescence, X-rays, ball tests, forged-on and cast-on test pieces. Neither of these methods alone was sufficient in itself to discover all the flaws.

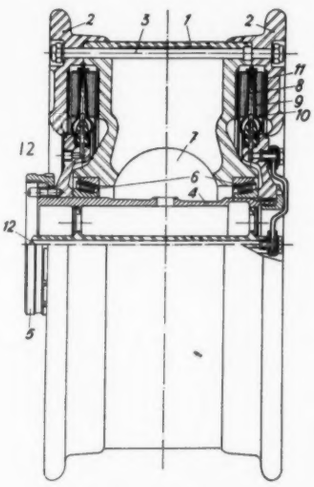
For the heaviest single components of the entire aircraft, the landing gear strut casings, type W 41 cast aluminum alloy had been chosen in 1945 on the basis of outstanding results obtained in laboratory tests (tensile strength 54,000 lbs./sq. in., limit of elasticity 35,500 lbs./sq. in., ultimate elongation 8%). However, size and weight prevented the timely solution of the manufacturing problems, notwithstanding the closest collaboration with the foundry personnel and moulder. As soon as the first test pieces had been cast, new official prescriptions tightened up the previous specifications.

As a result, the casing was finally arc-welded from thin chromium-molybdenum steel sheets, specification 20 CD 4, of uniform strength; the individual panels are single-curvature pieces, as they only could be bent but not drawn under the press in any circumstances. After detailed study of the most suitable heat treatment, the following order of work processes was established : delivery of the annealed sheets, cutting to size, forming and bending, heat treatment, adjustment on the welding jig, welding, and welding of the seams without the jig. The components thus obtained made possible a considerable weight saving compared with the cast parts.



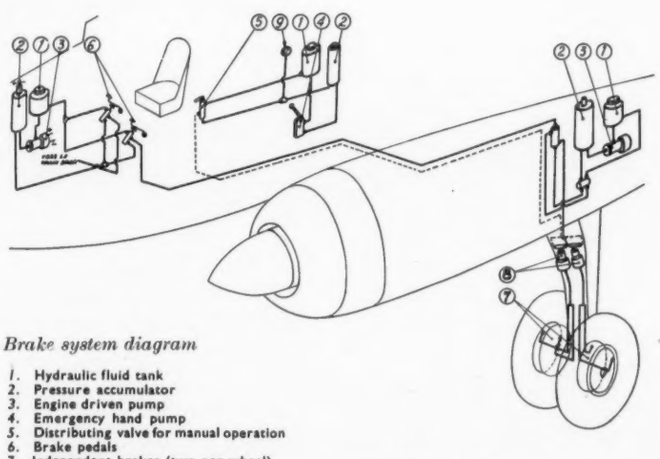
Section through Main Wheel Leg

1. Welded steel sheet casing
2. Pivot connecting with retraction actuator
3. Diaphragm of plunger piston with damping orifices
4. Fixed inner tube
5. Movable outer tube
6. Filling and inflation valve
7. Axis of retraction movement
8. Control plate for diaphragm orifices
9. Anti-emulsion plate



Section through Main Wheel

1. Inner element
2. Outer discs
3. Steel bolts
4. Stub axle
5. Cap nut
6. Tapering roller bearings
7. Ventilation vane
8. Brake capsule
9. Steel discs
10. Ferrodo lining
11. Malleable-iron brake rings
12. Independent pressure oil feeds



Brake system diagram

1. Hydraulic fluid tank
2. Pressure accumulator
3. Engine driven pump
4. Emergency hand pump
5. Distributing valve for manual operation
6. Brake pedals
7. Independent brakes (two per wheel)
8. Pressure convertor
9. Manometer

– – – – – Normal circuit
——— Emergency circuit

* This data supplied by Dunlop has been incorporated by the editors in Engineer Renollaud's article—*Ed.*

The casing of the nose wheel strut first consisted of a light alloy casting. In spite of the most minute inspection prior to delivery, a crack appeared in a large recess in the course of high speed taxiing tests; in smaller, geometrically precisely identical components in which the radius of the corresponding recess had been smaller, no such cracks had become apparent in over three years of operation. Painstaking tests with other cast casings of the same series revealed no source of trouble, when an inspector suddenly discovered a similar hair crack at the same point. This cut short further experimentation. Without waiting for an explanation of the cause, the nose wheel strut casing was also welded from steel sheet.

Although of simple design on paper, the brakes presented serious manufacturing problems. For the stamping of the cymbal-like elastic steel discs, the most suitable shape of the forms and dies had to be determined in endless hit-and-miss experiments, since these components must be shaped differently when not subjected to a strain than when they are fitted to the brake under tension, whereas the die must provide yet for another shape.

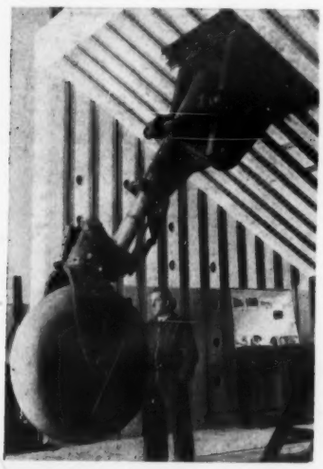
The pressure cases of the brakes were originally scheduled to be made of rubber. Their plans were readily established. Interminable disappointments followed during manufacture. There was not a single testing method which disclosed the cause of porosity in the material, so that the manufacturers finally decided to use metal also for this component. After that it was found that the required thin sheets were not available in sufficiently large sizes. The joints along which the two halves of the case were to be beaded together and made tight by soft soldering were precisely at the point of greatest deformation and failed as a result of fatigue. A large expenditure of brass and stainless steel sheets finally made it possible to turn out extremely flat casings which are electrically welded together along their edge and along the central disc and which seem to be giving satisfaction.

The Tests

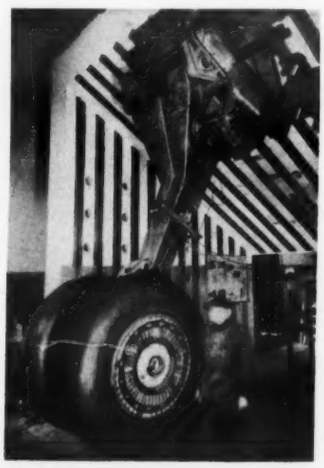
As early as 1946 SNCA du Sud-Est, which had established its conditions of acceptance with unequalled thoroughness, ordered a series of giant trestles measuring about 15 feet in height for the purpose of subjecting the full-scale landing gear to a series of systematic endurance tests under operational conditions. Apart from these tests, which took place at the Thouars works of DOP, ONERA (the French national aeronautical research organization) conducted its own dynamic and strength tests at Toulouse.

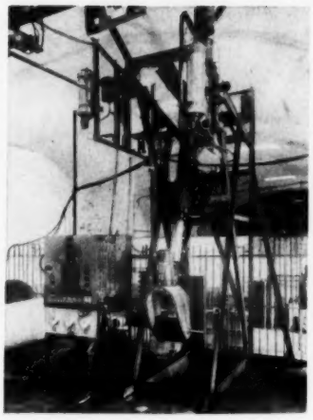
All three landing gear elements were mounted into trestles in the position they would assume in the aircraft and spaced correspondingly from each other. All the hydraulic and electric circuits and their attachment fittings were exactly identical to those to be used in the actual installation. The forces being produced by the gear well doors, the aerodynamic forces and the anticipated excess loads on wheels and tires also were simulated by imposing generously calculated extra stresses. In place of the 24-volt electric power installation of the aircraft, a 600-Watt generator unit captured in a pill box of the ex-German West Wall was found to be useful to provide the necessary current.

Nose wheel strut mounted at ONERA's laboratories for dynamic tests

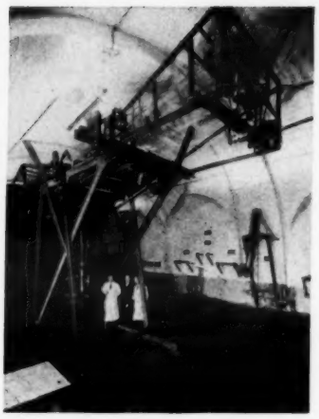


Main wheel during dynamic tests





Nose wheel strut in the endurance test rig



Main wheel strut in endurance test rig.

The tests began on October 1st, 1947. Between July 16th and August 4th, 1948, the landing gear was retracted 1,000 times. The various incidents which occurred during these trials never affected a vital operation. With all incidental loads the process of retraction finally took 15 seconds, compared with roughly 40 seconds when the tests were started. The lowering movement had to be braked in order to avoid sudden shocks at the end of the gear's downward travel; the operation of lowering was arranged so as to absorb the same amount of time as the retraction process. Every tenth retraction test was made with the emergency equipment on the assumption that the elcctric power supply failed, and at every hundredth test a failure of the hydraulic fluid system (pipe fracture) was additionally simulated.

Upon completion of these tests the entire landing gear was dismantled, inspected and re-assembled. It was found that only the sealing rings on the sliding surfaces had to be replaced. A second series of tests comprising 630 retraction and lowering operations was then made and gave similarly satisfactory results.

Shimmy tests were scheduled to be carried out at ONERA's laboratory at Toulouse. However, the installation built for this purpose turned out to be of insufficient strength for the purpose. The result was that the entire scaffolding began to shimmy, whereas the landing gear itself remained impassible. More successful were drop tests in which the wheel was pre-rotated before "touching down" to achieve a circumferential speed of 125 m.p.h. This test was carried out to determine whether any component would jam or fail when subjected to strongly rearward inclined forces. So far more than 100 such tests have been made with the main wheel units and about 50 with the nose wheel, and no damage has incurred in any of them.

Successful Results

The outcome of this close collaboration between the buyer of the aircraft, Air France, the SNCA du Sud-Est aircraft manufacturing concern, and the DOP landing gear specialists, working under the attentive and impartial supervision of the government control authorities, is well illustrated by a brief statement of fact :

Up to the time when the flying trials of the SE 2010 "Armagnac" were interrupted last December, the aircraft had made 55 take-offs and landings without any trouble whatsoever.

The testing of components prior to the initial flight may be costly, but it does pay off.

ERRATUM

The author of "Aerodynamic Forces on the Parachute" (cf. No. 1-2, 1950) requests us to make the following correction to the footnote on page 81 :

Professor Dr. Ing. Georg Madelung was the Director of the "Graf Zeppelin" research institute at Stuttgart and was mainly responsible for the creation of the ribbon parachute. Dr. Ing. Heinrich was the chief of the Institute's Aerodynamics Division.

PHOTO CREDITS

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Structural Details and Specifications

FUSELAGE

Three main assemblies : centre section (pressure cabin), nose section (nose wheel well), and tail section (empennage attachments). Centre section closed fore and aft, of circular cross section, divided by a floor into a main deck (all passenger compartments and lower deck (mail and freight holds). The height of the wing spar girder necessitates a division of the passenger cabin into two compartments (between them the service compartments, *e.g.*, the galley, located at a higher level above the spar), and two cargo holds. The structure of the fuselage is illustrated on pages 141-142. Encircling the control cabin is a reinforced cross frame (circular structure of predominantly box-shaped cross section) carrying flanges supporting the nose wheel strut; where the spar girder passes through the fuselage ten closely-spaced I-shaped circular frames are fitted; they are broken at the sides and absorb the forces from the box spar webs and longitudinal stiffeners by means of riveted fish plates, fittings, screw bolts, etc.

WING

Flexion- and torsion-resistant box-type girder passing through the fuselage, featuring solid plate webs and flanges; extruded corners and continuous Z-shaped longitudinal stringers. Auxiliary rib frames of Ω-extrusions with truss-type stiffeners of square-section tubular ties; main ribs partly of lattice work, partly frame-shaped with extruded Ω-flanges, perforated sheet webs and U-section filleting members; solid ribs to divide the interior of the girder into eight fuel tanks (two in each outer wing panel and one on each side of the inboard engine nacelles).
Engine nacelles of monocoque construction, open underneath, reinforced by four longerons leading from the engine-mount attachments to the box girder.
Leading edge section in four parts per wing half, attached to the spar structure by fixed hinges at the upper edge, by removable hinges at the lower edge; hence, they can be hinged upwards. Stiffened ribs, each consisting of two arc-shaped formers. Integral hot air ducts and baffle plates for de-icing purposes directly underneath the skin.
Trailing edge section with auxiliary ribs and main ribs (the latter carrying ailerons and flaps) of lattice work construction (auxiliary ribs resembling those of the box girder, main ribs of open sheet sections).
Wing tips of two half-shells welded together, with light auxiliary ribs.
Two *ailerons* per wing half; single-spar metal sheet construction, leading edge sheet-covered, trailing edge portion fabric-covered. Inboard ailerons fitted with automatic tabs, port outboard aileron with a manually controlled tab.
Five *double-slot camber-changing landing flaps* per wing half. They are equipped with leading edge slats of strongly-cambered section and are carried by links to deflect rearwards and downwards (maximum deflection 40 degrees), the slat being moved into a position between wing and flap so as to guide the air stream through the slots. Linkage-controlled cover flaps on the wing close the slot when the landing flap is in the retracted position.

EMPENNAGE

The vertical fin features a box-type spar tapering towards the top; the fore and aft webs of this spar are riveted to cross frames of the fuselage rear by means of fish plates. Truss-type ribs. Leading edge section similar to that of the wing.
Stabilizer with a continuous box-type spar, the two halfs of which are bolted together in the aircraft centre line; webs and flanges of metal sheet of tapering thickness. Sheet ribs with stiffeners. Attached to two reinforced cross frames of the fuselage rear by four conical bolts; adjustable by means of interchangeable fittings and filler blocks. Leading edge portion as in the wing and vertical fin. Stabilizer rear portion : elevator fittings on extended box-type ribs, portions between these ribs similar in construction to the leading edge portion.
Elevator of two parts on either side of the fuselage. Design similar to that of ailerons. Three automatic tabs and three trim tabs on either side.
Rudder of two parts, single-spar construction with sheet-covered torsion-resistant leading edge, followed to the rear by fabric-covered truss-type ribs. Two controllable trim tabs and three spring-loaded auxiliary tabs.

LANDING GEAR

Detailed description on pages 144 to 146.

CONTROLS

Elevator and aileron control by means of a pair of sticks for each of the two pilots. Rudder control by adjustable pedals. Duralumin tubular push-pull rods in the fuselage beneath the dividing floor, as well as in the wing and fixed control surfaces ahead of the box girders, fully accessible.
Trimming tab adjustment by means of torque tubes operated from a desk between the two pilot seats, for elevator and rudder by servo motor or manually, for ailerons manually.
Landing flaps operated by an electric servo motor in the fuselage, via torque tubes and reduction gears in the wing and links, or manually in emergencies.
Engine controls by means of cables.

POWER PLANT

Four Pratt & Whitney R-4360 B 13 "Wasp Major" air-cooled 28-cylinder 4-row engines with single-stage two-speed superchargers. Curtiss C 644 S four-blade constant-speed airscrews.

SPECIFICATIONS

MAIN DIMENSIONS

Span	160 ft. 7 ¼ in.
Length	130 ft. ¼ in.
Height	43 ft. 10 ½ in.

Fuselage

Overall length to rudder axis	123 ft. 2 ¼ in.
Maximum diameter	15 ft. 5 in.
Length of pressure cabin	98 ft. 5 ¼ in.
Total volume of pressure cabin	12,700 cu. ft.
Volume of passenger cabins (main deck)	9,900 cu. ft.
Volume of forward cargo hold	600 cu. ft.
Volume of rear cargo hold	880 cu. ft.

WING

Total area	2,542.97 sq. ft.
Flap area	439.74 sq. ft.
Aileron area	102.48 sq. ft.
Aspect ratio	10.15
Root chord	23 ft. 5 ½ in.
Tip chord	6 ft. 7 1/8 in.
Root thickness	17 %
Tip thickness	10 %

EMPENNAGE

Elevator Unit,	Span	53 ft. 1 3/8 in.
	Total area	474.7 sq. ft.
	Elevator area	132.0 sq. ft.
Rudder Unit,	Total area	418.7 sq. ft.
	Rudder area	178.5 sq. ft.

LANDING GEAR

Tread (centre of main gears)	32 ft. 9 1/8 in.
Wheel base	47 ft. 3 ¾ in.

POWER PLANT

Take-off power at 2700 r.p.m. with water injection	3,500 HP	
without water injection	3,250 HP	
Rated power at 2500 r.p.m.	2,650 HP	6,000 ft.
Cruising power at 2300 r.p.m. low supercharge gear	1,750 HP	10,660 ft.
high supercharge gear	1,550 HP	20,500 ft.
Airscrew diameter	15 ft. 2 1/8 in.	
8 Fuel tanks, total capacity	6,910 Imp. gals.	
6 Oil tanks, total capacity	310 Imp. gals.	

WEIGHTS

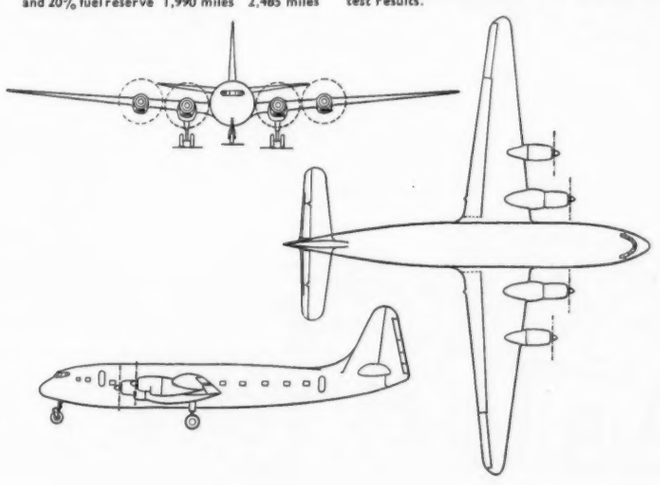
Fuselage	13,800 lbs.
Wing	25,510 lbs.
Empennage	3,150 lbs.
Landing gear	11,550 lbs.
Power plant	24,030 lbs.
Tanks	330 lbs.
Weight empty	78,370 lbs.
Fixed equipment	3,970 lbs.
Movable equipment	16,530 lbs.
Tare weight	98,870 lbs.
Useful load	62,060 lbs.*
Gross weight	160,930 lbs.*
Take-off wing loading	63.2 lbs/sq. ft.*
Take-off power loading	11.53 lbs/HP*

ESTIMATED PERFORMANCE

Maximum speed at 14,760 ft. at gross weight of 127,240 lbs. on 2300 h.p. per engine	307 mph
Cruising speed at 19,680 ft. at gross weight of 137,240 lbs. on 1750 h.p. per engine	281 mph
Rate of climb at sea level at gross weight of 160,940 lbs. on 2000 h.p. per engine	531.6 ft/min.
Service ceiling with three engines	19,950 ft.
Distance to clear 50-ft. obstacle at gross weight of 160,940 lbs.	4,534 ft.
Landing distance after clearing a 50-ft. obstacle at gross weight of 137,240 lbs. (without propeller reversion)	2,890 ft.
Theoretical range on 1,750 h.p. per engine and at average cruising speed of 274 mph at 19,680 ft.	3,730 miles
Practical range in 43-m.p.h. headwind, with allowance for 45 mins. stacking before landing and 20% fuel reserve	1,990 miles 2,485 miles

Corresponding fuel supply	39,680 lbs.	48,390 lbs.
Crew	1,080 lbs.	1,080 lbs.
Corresponding Pay-load	21,300 lbs.*	12,590 lbs.*
Useful load as above	62,060 lbs.*	62,060 lbs.*

* Changes in admissible max. take-off gross weight may be possible on the basis of take-off test results.



Air craft propulsion
Air - Conditioning

Turbo - generators
Measuring instruments

TURBOMECA

SZYDLOWSKI patents

BORDES — BASSES-PYRÉNÉES

LOCKHEED

27, RUE JULES-VERNE — SAINT-OUEN
(SEINE)
TELEPHONE : MONTMARTRE 32-03

HYDRAULIC CONTROLS AND TRANSMISSIONS
FLEXIBLE TUBES
SELF-SEALING PIPE COUPLINGS WITH NON-RETURN VALVE

PEKLY

33, Rue Boussingault
PARIS - XIII•
ELECTRIC MEASURING INSTRUMENTS

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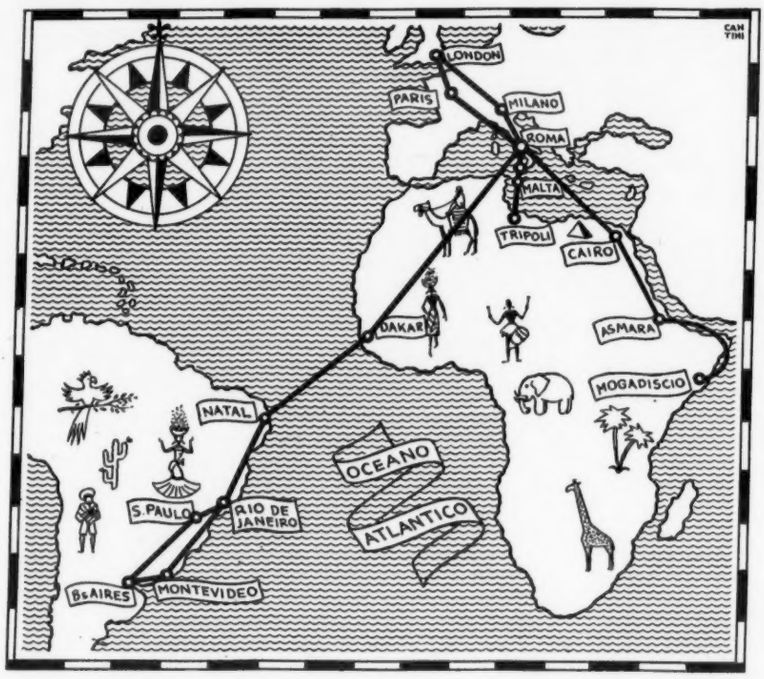

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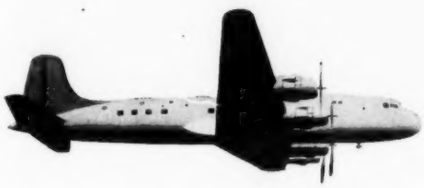

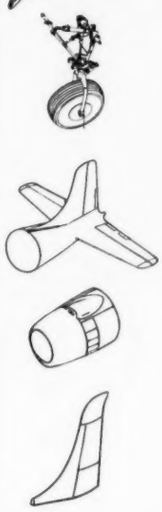

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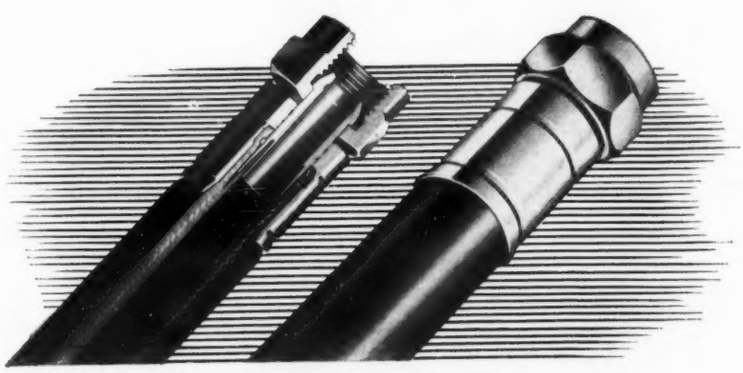

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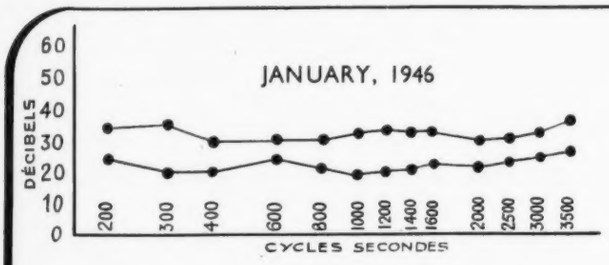

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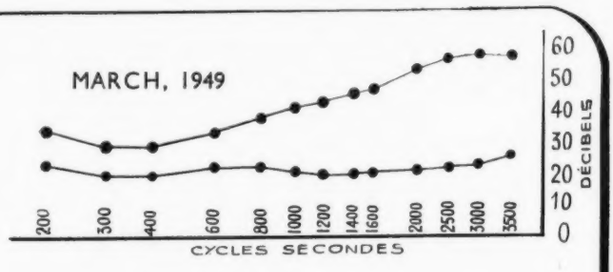

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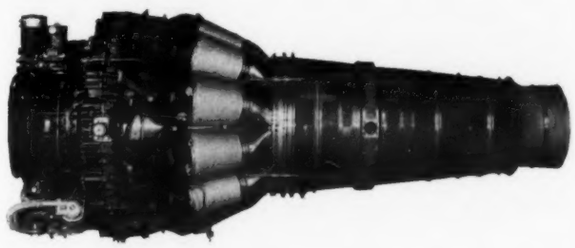

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Rated power at 2,250 r.p.m.	145 h.p.	Rated power at 2,250 r.p.m.	215 h.p.
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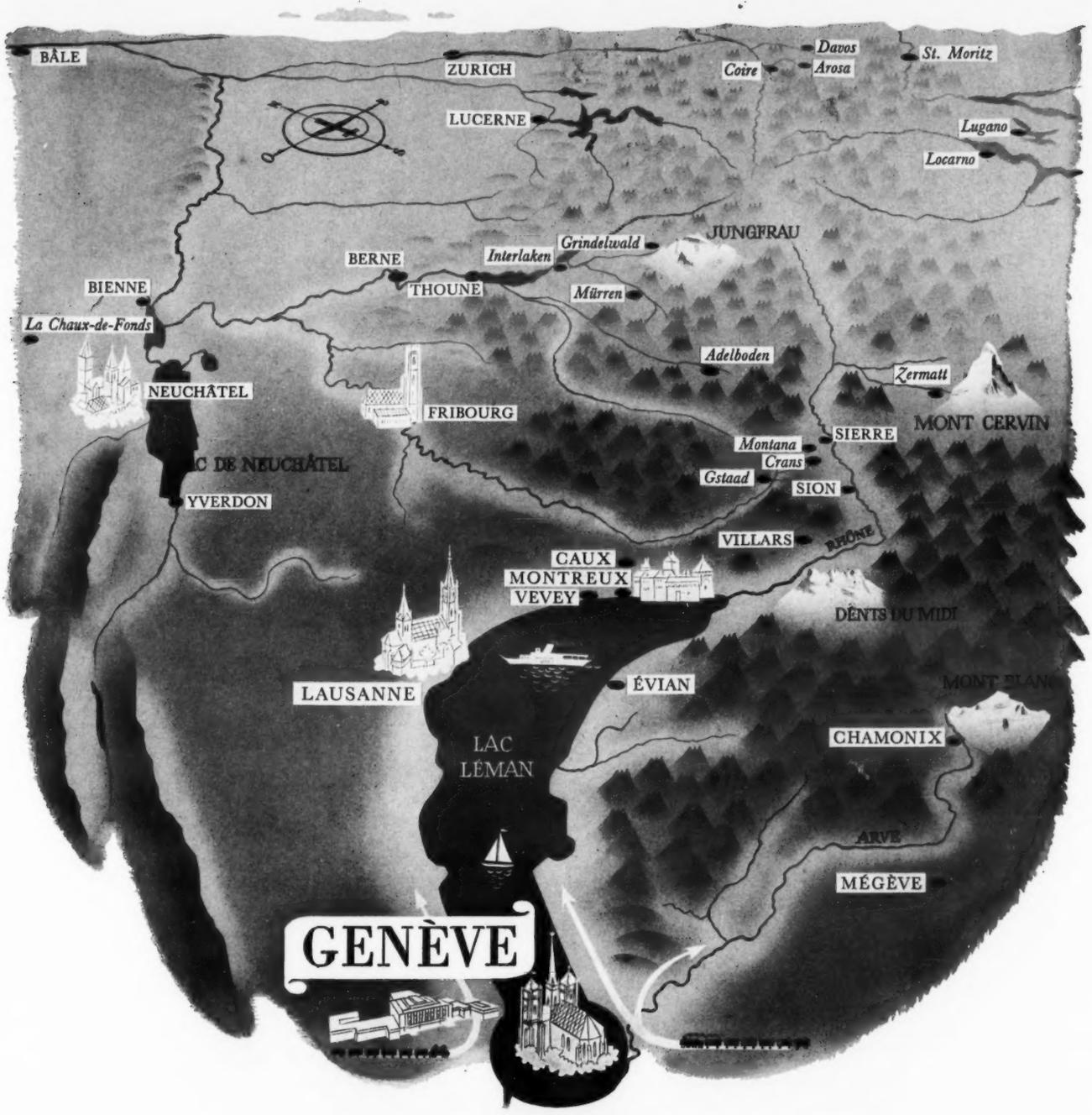

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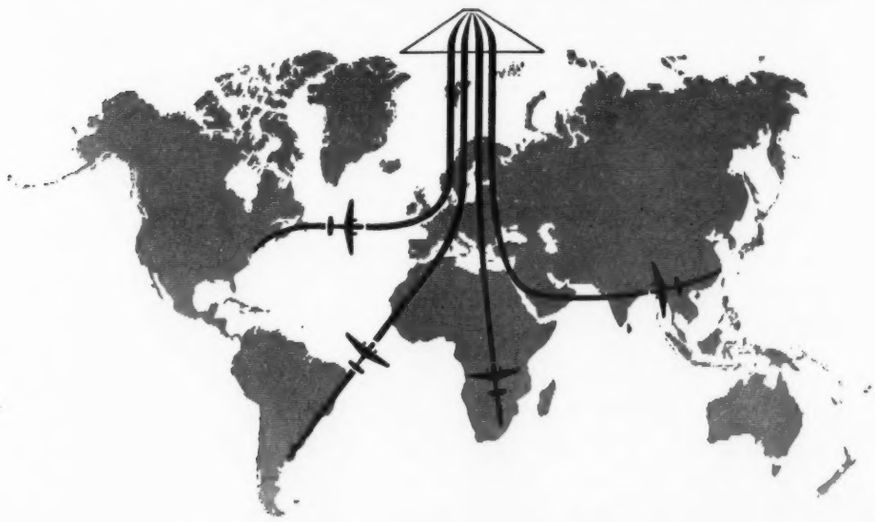

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